SNIA
SFF TWG
Technology Affiliate

SFF-TA-1020

Specification for

Cables and Connector Variants Based on SFF-TA-1002

Rev 1.0.2 ~~February 19~~September 1, 2023~~0~~

SECRETARIAT: SFF TA TWG

This specification is made available for public review at https://www.snia.org/sff/specifications. Comments may be submitted at https://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. This specification originates from the Gen Z Consortium and supersedes their prior documents.

ABSTRACT: This specification defines cables and connector variants based on the SFF-TA-1002 connector system. In addition to cables, this specification defines a vertical 280 pin variation~~, and~~ a 12V and 48V high power segment for 4C connectors, and a 28-pin cable plug and receptacle.

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- Results of IP Disclosures: https://www.snia.org/sffdisclosures
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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 https://www.snia.org/sff/join.

Revision History

Rev 1.0 *February 19, 2020*

- Initial Release

Rev 1.0.1 *May 05, 2021*

- Update general description in Section 4 to include 28 Pin and 4C+, and adjust reference to maximum number of high speed differential pairs supported for 1C, 2C, 4C, and 4C-HP
- Add references to 28 Pin and 4C+ to Section 4.1 text
- Update to Figure 4-1 to include 4C+
- Update to Figure 4-2 to include 4C+ and 28 Pin
- Update to Table 4-1 to include 4C-HP, 280 Pin, 4C+, and 28 Pin
- Update to Figure 4-3 and Figure 4-4 to include 4C+
- Add references to 28 Pin and 4C+ to Section 5 text
- Update to Figure 5-4, Figure 5-5, and Figure 5-6 to reference Details in Figure 5-8
- New Figure 5-7 of 4C+ Plug
- Renamed Figure 5-7 to 5-8; Update figure to include Detail D, updated notes under Detail labels to include 4C+ where applicable.
- Updated Figure numbering from 5-9 through 5-13
- New Figure 5-14 of Vertical 4C+
- Updated Figure numbering for previous Figures 5-13 to 5-16 to 5-15 to 5-18
- New Figure 5-19 of Right Angle 4C+
- New Section 5.4 for 28 Pin Cable Requirements
- New Figure 5-12, Overview of 28 Pin cable receptacles and plugs
- New Figure 5-21 of 28 Pin Plug
- New Figure 5-22 of 28 Pin Plug interface
- New Figure 5-23 of 28 Pin Plug pad definition
- New Figure 5-24 of Vertical 28 Pin Receptacle
- New Figure 5-25 of Side Profile of Vertical 28 Pin Receptacle
- New Figure 5-26 of Right Angle 28 Pin Receptacle
- New Figure 5-27 of Side Profile of Right Angle 28 Pin Receptacle
- New Figure 5-28 of 28 Pin Locus of Mating Interface
- New Figure 5-29 of 28 Pin Locus of Vertical SMT Tails
- New Figure 5-30 of 28 Pin Locus of Right Angle SMT Tails
- New Figure A-4 of 4C+ Vertical Receptacle Footprint
- New Figure A-5 of 28 Pin Vertical Receptacle Footprint
- New Figure A-9 of 4C+ Right Angle Receptacle Footprint
- New Figure A-10 of 28 Pin Right Angle Receptacle Footprint
- Updated lost reference to table in Section A.3

Rev 1.0.2 *September 1, 2023*

- Included reference to 28 pin cable plug and receptacle
- Remove "Error! Reference source not found" cross-reference within Section 4.1
- Updated footnote Copyright to reflect 2021
- Removed reference within figure image to another figure within this document for detail views. Replaced by adding a comment below figure that is easily edited in the future should it be necessary. Figures affected are: Figure 5-4, Figure 5-5, Figure 5-6, Figure 5-7, and Figure 5-21
- Added reverse proofing alternative 1C vertical receptacle configuration.

- Added 2.36 mm thick card edge variant (2C-2.36)
- Editorial fixes for links, references, dates.

Contents

Figures

Tables

1. Scope

This specification defines the electrical, mechanical, reliability, and manufacturing requirements of SFF-TA-1002 based cables and connectors. The connectors in this specification leverage the SFF-TA-1002 wherever possible while enabling additional features such as cable attach, high power, and high pin count for additional applications.

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-364-05 — Contact Insertion, Release and Removal Force Test Procedure for Electrical Connectors published by the Electronic Industries Alliance
- EIA-364-13 — Mating and Unmating Force Test Procedure for Electrical Connectors and Sockets published by the Electronic Industries Alliance
- EIA 364-23 — Low Level Contact Resistance Test Procedures for Electrical Connectors and Sockets published by the Electronic Industries Alliance
- EIA-364-27 — Shock Test Procedure for Electrical Connectors published by the Electronic Industries Alliance
- EIA-364-28 — Vibration Test Procedure for Electrical Connectors and Sockets published by the Electronic Industries Alliance
- REF-TA-1011 — Cross Reference to Select SFF Connectors
- SFF-TA-1002 — Protocol Agnostic Multi-Lane High Speed Connector

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 https://www.snia.org/sff/specifications. Suggestions for improvement of this specification ~~will be~~are welcome~~, they~~ and should be submitted to https://www.snia.org/feedback.

Copies of PCIe standards may be obtained from PCI-SIG (https://pcisig.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: 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
BP: Back panel
HP: High Power
PCB: Printed Circuit Board
PTH: Plated Through Hole
RA: Right Angle
RAND: Reasonable And Non-Discriminatory
SMT: Surface Mount Technology

3.3 Definitions

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.

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~~Figure 3-1~~. Plugs typically contain stationary contacts. Other common terms include male, pin connector, and card edge.

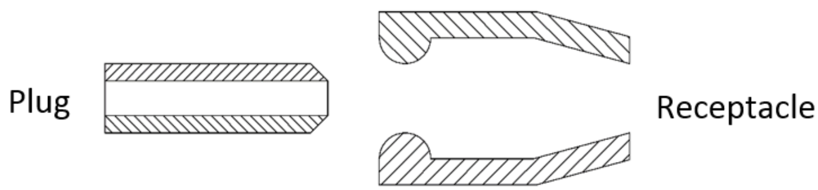


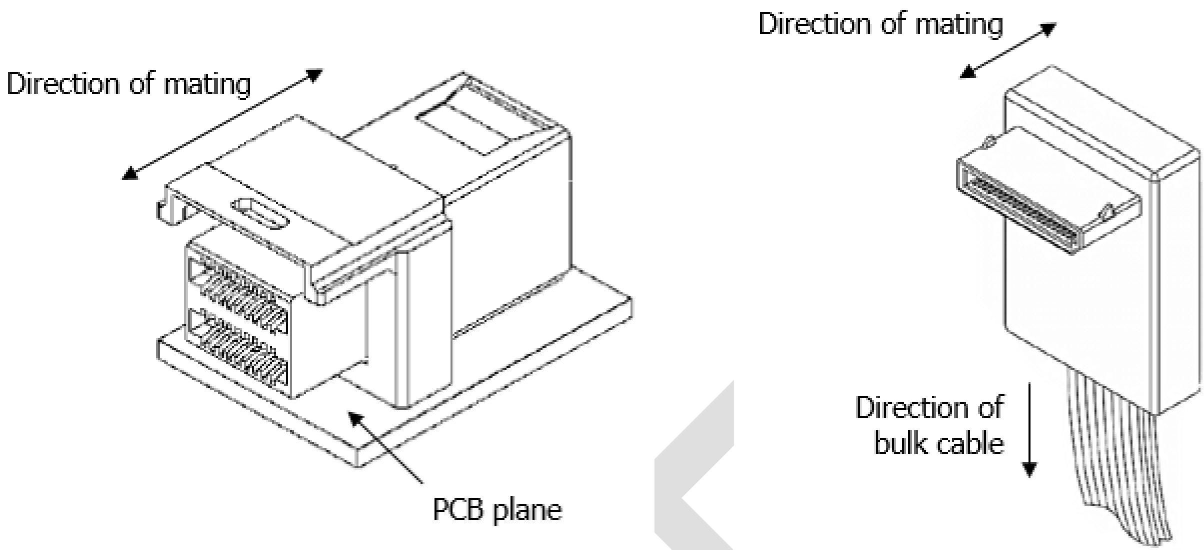
Figure 3-1. Plug and Receptacle Definition

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~~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.



a) Right angle connector

b) Right angle cable assembly

Figure 3-2. Right Angle Connector and Cable Assembly

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. 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.

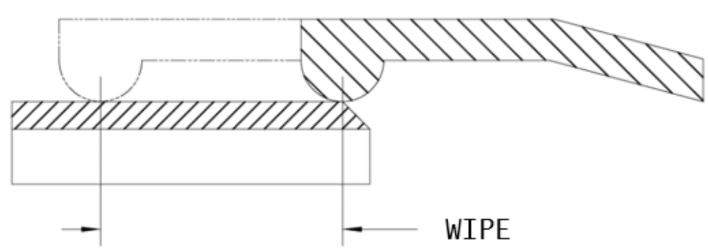


Figure 3-3. Wipe for a Continuous Contact

4. General Description

As stated, this specification defines cables and additional connector variants for the SFF-TA-1002 connector ecosystem. Figure 4-1 illustrates the additional connector variations, 4C-HP and 280 Pin Connector, compared to SFF-TA-1002 connectors. These connectors provide the following:

- 28 Pin connector supports up to 8 differential pairs of data signals
- 1C connector supports up to 18 differential pairs of data signals as specified in *SFF-TA-1002*.
- 2C connector supports up to 2~~1~~6 differential pairs of data signals as specified in *SFF-TA-1002*.
- 4C connector supports up to 44~~32~~ differential pairs of data signals as specified in *SFF-TA-1002*.
- 4C-HP connector supports up to 44~~32~~ differential pairs of data signals as specified in *SFF-TA-1002*, and a high-power interface as specified in this document.
- 4C+ connector supports up to 52 differential pairs of data signals as specified in *SFF-TA-1002*
- 280 Pin connector supports up to 90 differential pairs of data signals

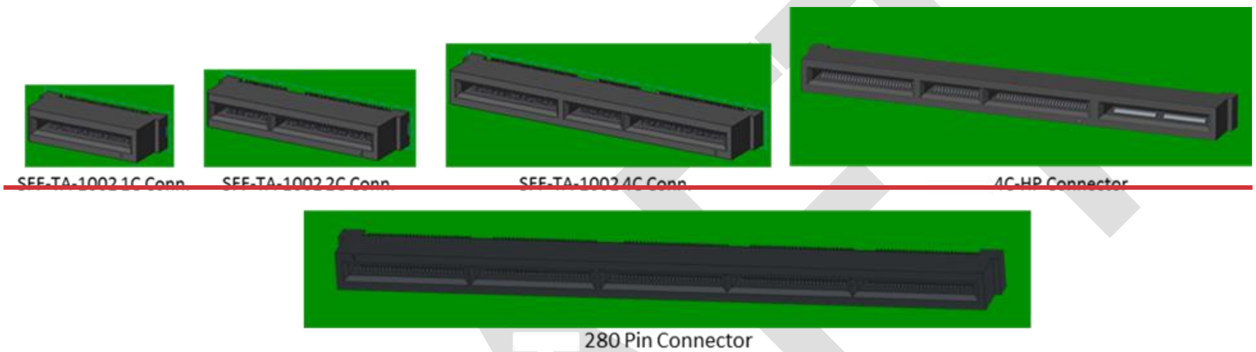
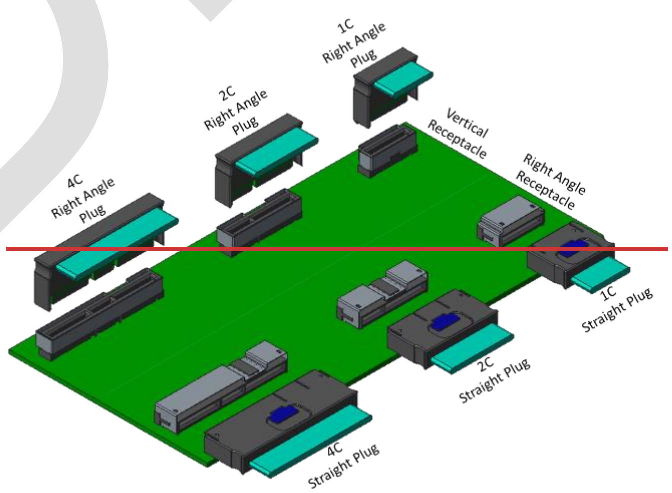


Figure 4-1. SFF-TA-1002 Connector Sizes for Reference and 4C-HP and 280 Pin Connectors

Figure 4-1 illustrates the internal cable plugs and connectors defined in this specification.



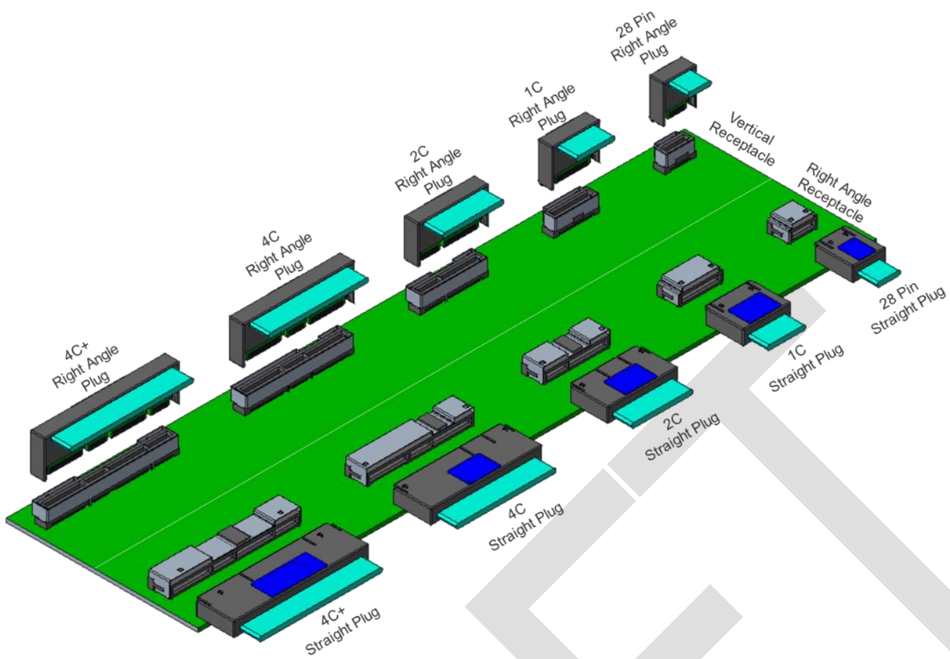


Figure 4-2. Internal Cable Plug and Receptacle Overview

4.1 Interoperability

Figure 4-2**Error! Reference source not found.**~~**Error! Reference source not found.**~~ illustrate~~s~~s the interoperability of the cables and connector variants defined in this specification and SFF-TA-1002 connectors. AICs interoperate as follows:

- A 1C AIC shall interoperate with a 1C, 2C, 4C, 4C+, or 4C-HP connector.
- A 2C AIC shall interoperate with a 1C, 2C, 4C, 4C+, or 4C-HP connector.
- A 4C AIC shall interoperate with a 1C, 2C, 4C, 4C+, or 4C-HP connector.
- A 4C-HP AIC shall interoperate with a 1C, 2C, 4C, or 4C-HP connector.
    - A 4C-HP that supports 12V shall interoperate with a 4C-HP 12V keyed connector.
    - A 4C-HP that supports 48V shall interoperate with a 4C-HP 48V keyed connector.
    - A 4C-HP AIC does not interoperate with a 4C+

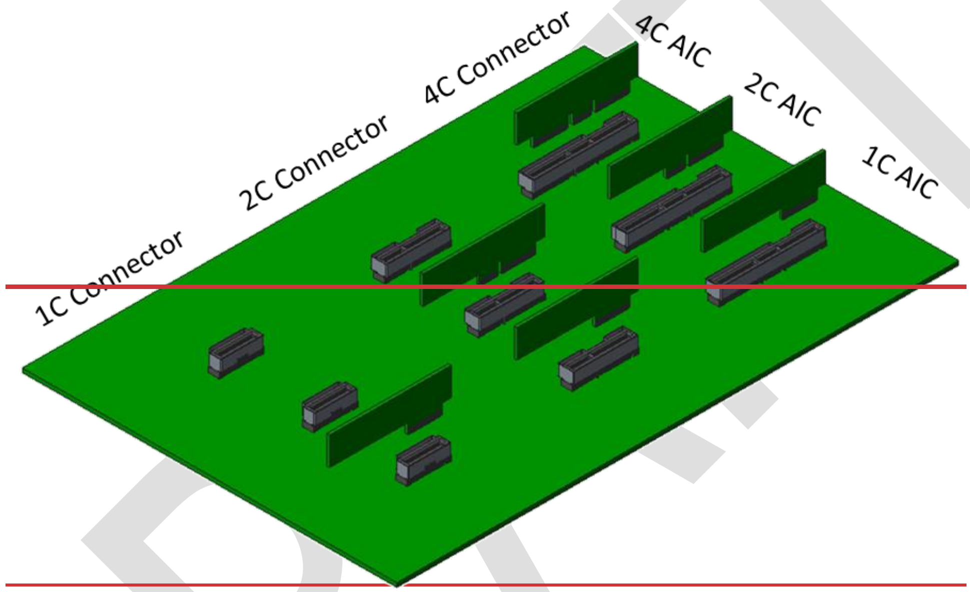
If an AIC supports multiple connectors, then each 1C, 2C, 4C, 4C+, or 4C-HP shall operate as described above. Internal cable plugs and receptacles are specified for 28p, 1C, 2C, 4C, and 4C+ sizes in this specification, and shall support the interoperability specified in ~~***Error! Reference source not found.***~~ Table 4-1 below.

Table 4-1. Cable and AIC Interoperability Matrix

		Module Card					
		1C Card Edge	2C Card Edge	4C Card Edge	1C Cable	2C Cable	4C Cable
Host Board	1C Card Edge Only						
	~~2C Card Edge Only~~						
	4C Card Edge Only						
	1C Cable Recpt						
	2C Cable Recpt						
	4C Cable Recpt						

		Module Card											
		1C Card Edge	2C Card Edge	4C Card Edge	4C+ Card Edge	4C-HP Card Edge (12V)	4C-HP Card Edge (48V)	280 Pin Card Edge	28p Cable	1C Cable	2C Cable	4C Cable	4C+ Cable
Host Board	1C Card Edge Only												
	2C Card Edge Only												
	4C Card Edge Only												
	4C+ Card Edge Only												
	4C-HP Card Edge Only (12V)												
	4C-HP Card Edge Only (48V)												
	280 Pin Card Edge Only												
	28p Cable Recpt												
	1C Cable Recpt												
	2C Cable Recpt												
	4C Cable Recpt												
	4C+ Cable Recpt												

The internal cable plug and receptacle interoperability is illustrated in Figure 4-3 and Figure 4-4.



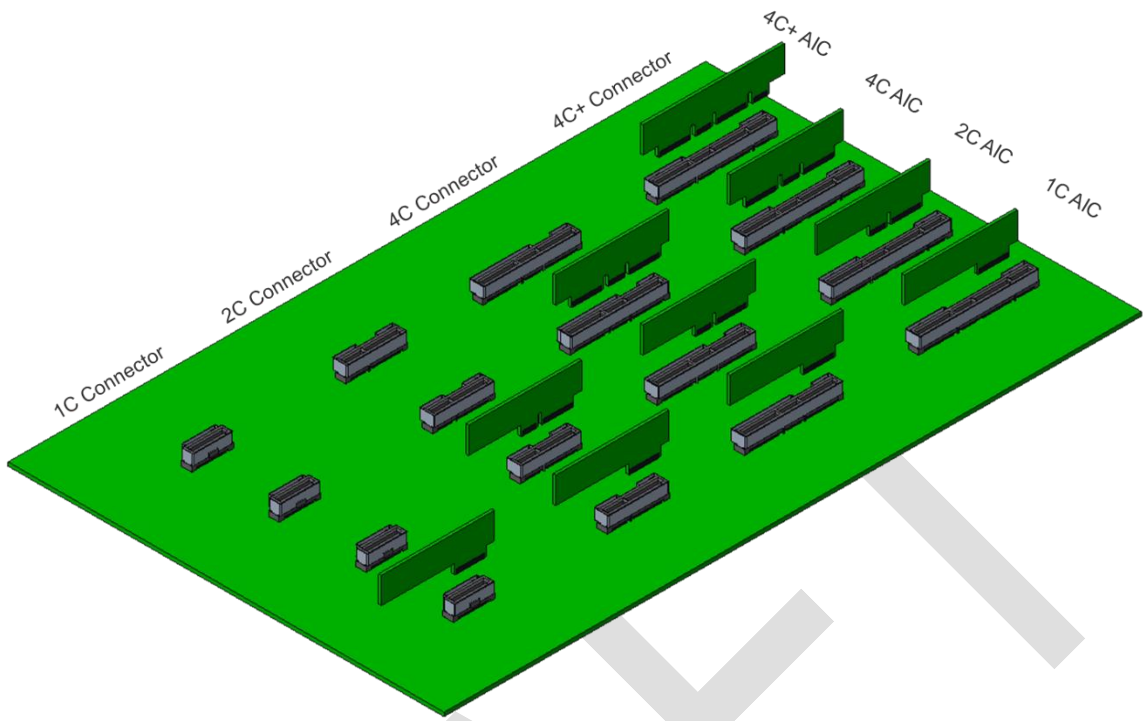
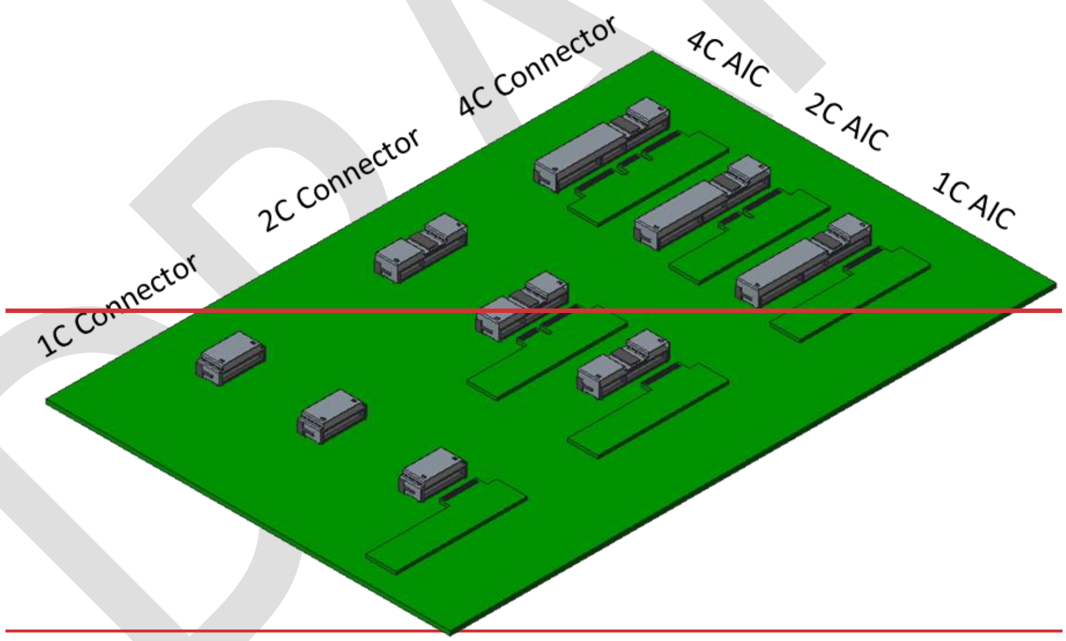


Figure 4-3. Vertical Internal Cable Connector and AIC Interoperability



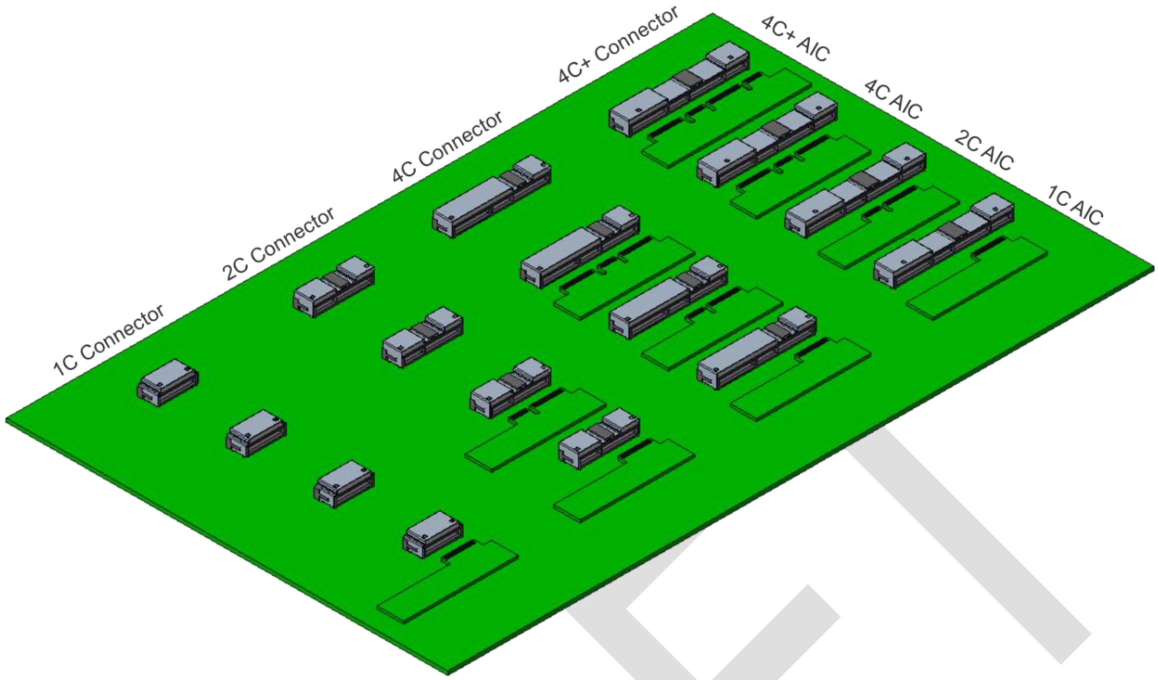


Figure 4-4. Right Angle Internal Cable Connector and AIC Interoperability

5. Cable Requirements

Cables support an active latching retention system to prevent accidental disconnection of the interface. The mating receptacle has mechanical support hardware providing strain relief and latching for the mating cable plug. The internal cable receptacles and plugs are specified in 1C, 2C and 4C configurations. All dimensions not specified in this document shall be as specified in *SFF-TA-1002*. The datum names are consistent for the receptacle connectors from *SFF-TA-1002* with additional datum(s) added for the internal cable supporting structure. Refer to SFF-TA-1002 for all electrical and signal integrity requirements unless otherwise specified.

- A 28 Pin, 1C, 2C, 4C, or 4C+ internal cable may support power.
- An internal cable may support sideband signals
- An internal cable that does not support power and / or sideband signals shall implement the full AIC interface including board dimensions and plated pads to ensure proper mechanical alignment between the connector contacts and the AIC pads and to avoid damage to the AIC and host.

5.1 Internal Cable Plug Dimensions

The internal cable plug dimensions illustrated in this section support both straight cable exit and right angle cable exit. All dimensions and tolerances conform to ASME Y14.5-2009. Tolerance unless otherwise specified +/- 0.13mm.

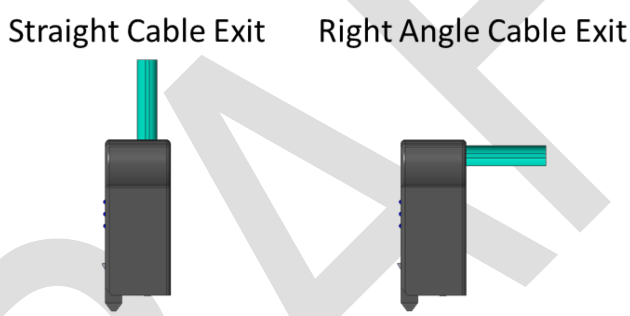


Figure 5-1. Side Profile Illustration for Straight and Right Angle Internal Cable Exit Plugs

The following internal cable plugs are specified to enable an internal cable-to-cable pitch of 9.3mm. For host designs that do not require a 9.3mm pitch, lower profile internal cable plugs (less than 21.5mm dimension below) may be enabled using wider housings (greater than 9mm dimension below)

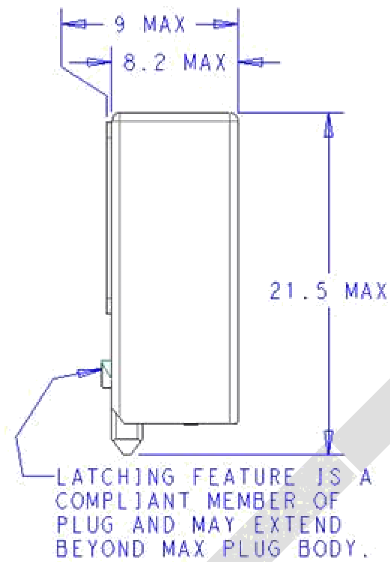


Figure 5-2. Standard Internal Cable Plug Side Profile

The internal cable plug requires a "push" operation to disengage the plug latch from the receptacle. To support a user's ability to disengage a mated internal cable when adjacent to another mated internal cable at the enabled internal cable-to-cable pitch, an alternative implementation using a pull tab is illustrated in Figure 5-3~~Figure 5-3~~. The mechanism in the internal cable plug is required to support disengagement actuation through a both a "push" operation and a "pull" operation (each functionally independent within the same plug).

Developer Note: *DC blocking capacitors may be placed on the host PCB, AIC PCB or, if needed per implementation, may be placed on the cable PCB within the cable plug assembly. The implementer should avoid redundant DC blocking capacitors in the channel. Depending on implementation, a cable plug assembly with DC blocking capacitors may require extending beyond the 21.5mm MAX height requirement.*

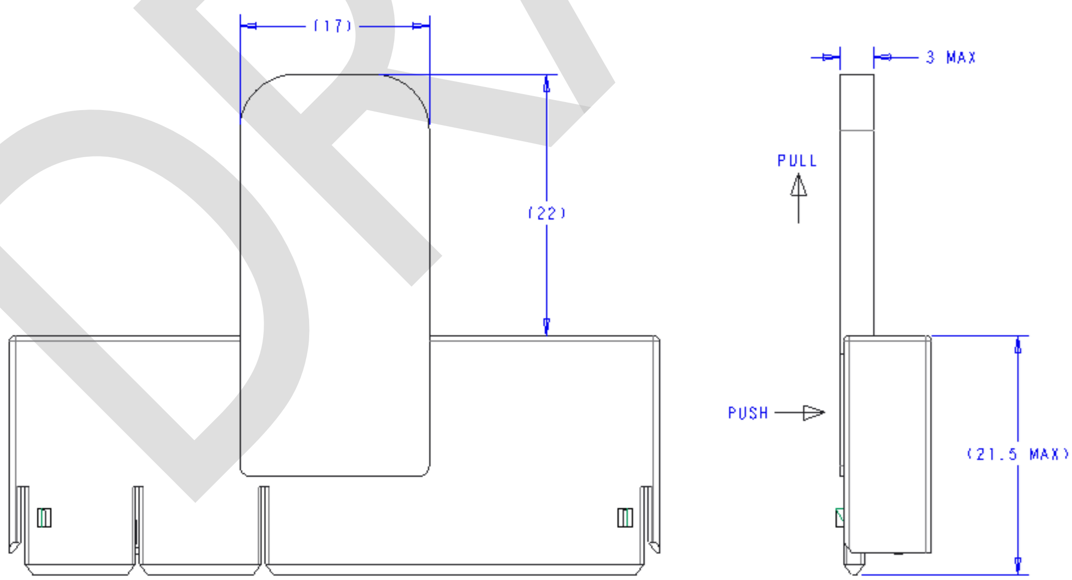
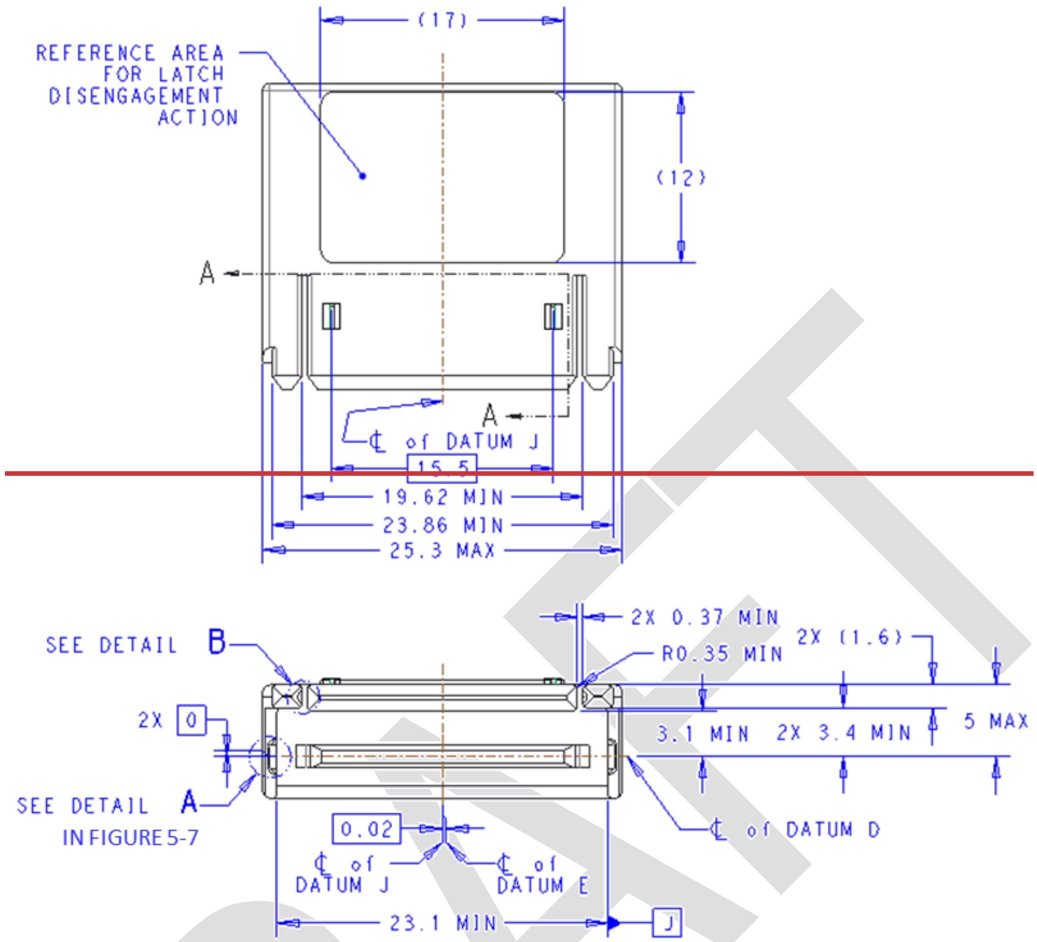
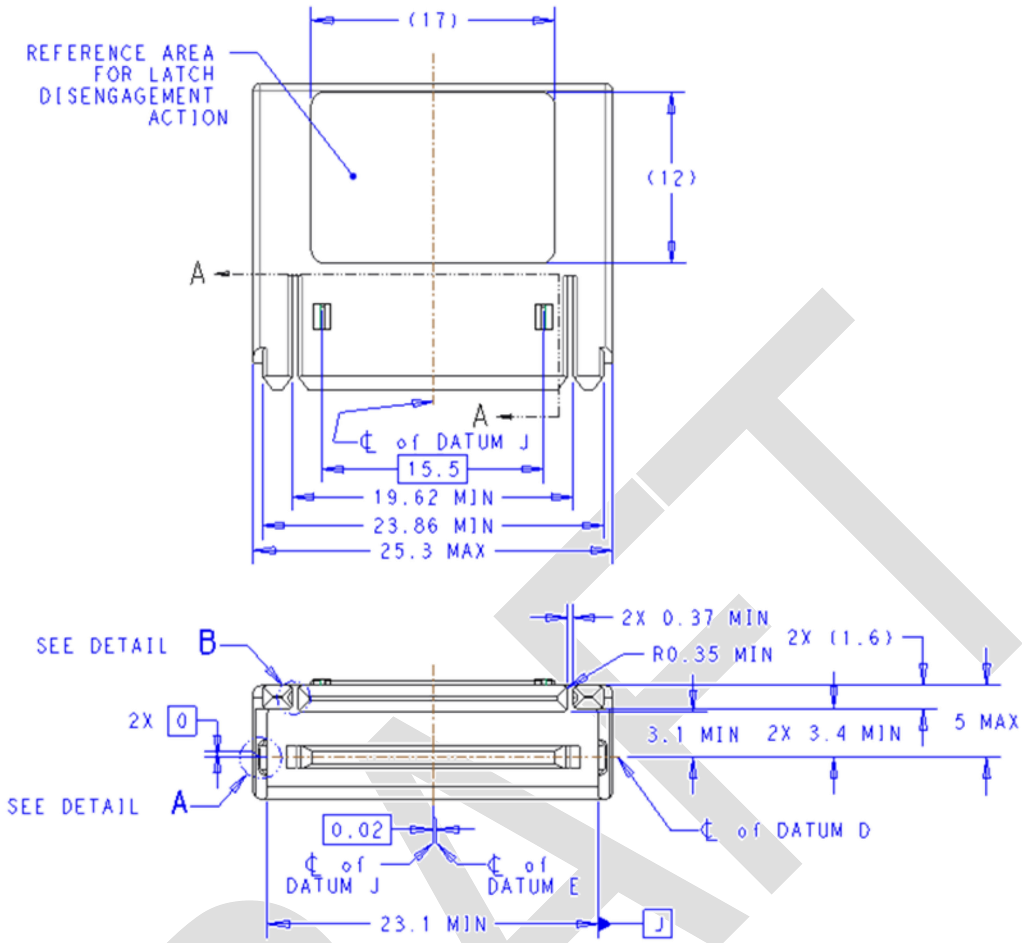


Figure 5-3. Alternative for Push Button / Pull Tab Envelope (applies to all internal cable plugs)

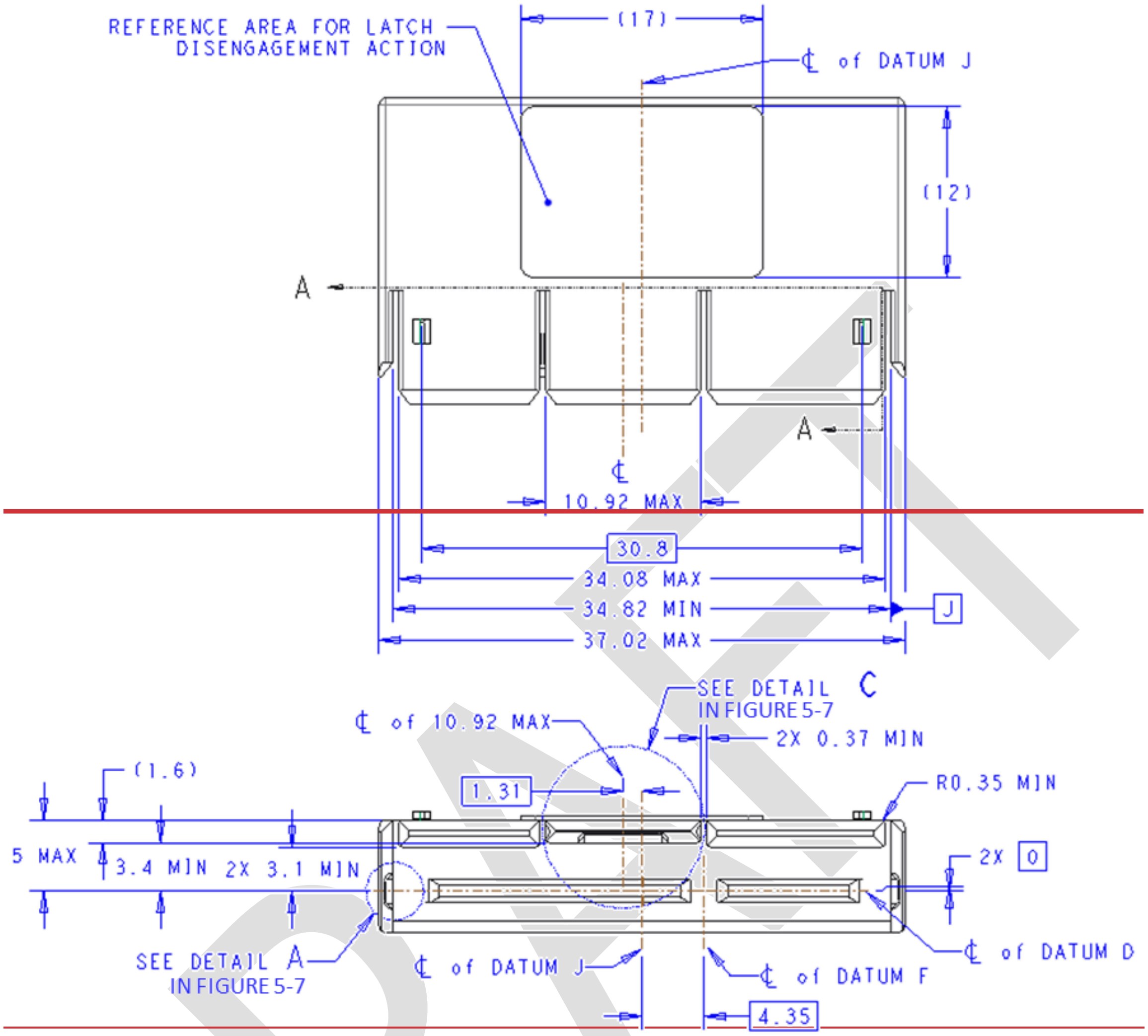


(17)
REFERENCE AREA FOR LATCH DISENGAGEMENT ACTION
(12)
A
A
℄ of DATUM J
15.5
19.62 MIN
23.86 MIN
25.3 MAX
SEE DETAIL B
2X 0.37 MIN
R0.35 MIN
2X (1.6)
2X 0
3.1 MIN
2X 3.4 MIN
5 MAX
SEE DETAIL A IN FIGURE 5-7
0.02
℄ of DATUM J
℄ of DATUM E
℄ of DATUM D
23.1 MIN
J

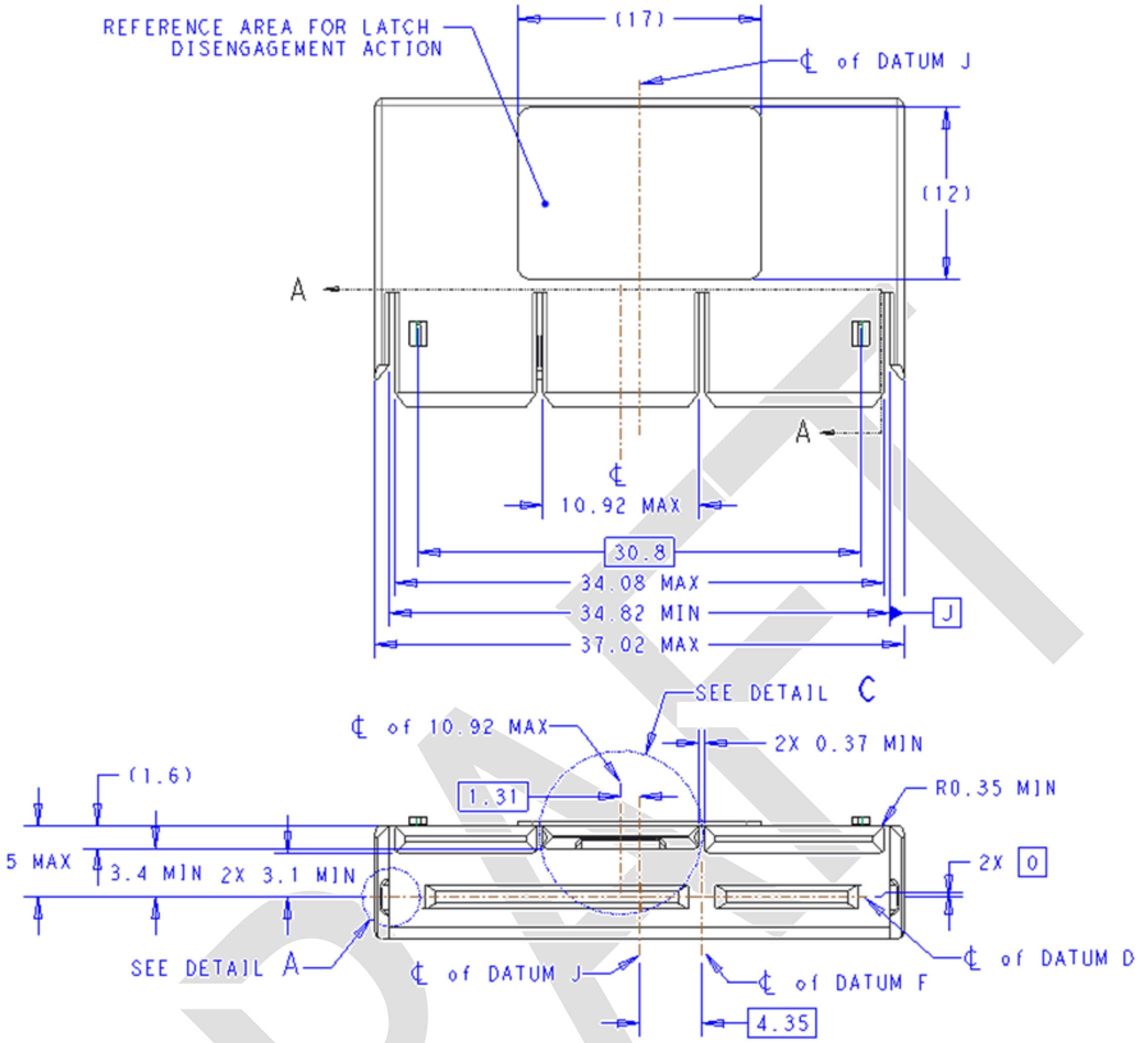


[Comment: See Detail A and Detail B in Figure 5-85-8~~Figure 5-8~~.]

Figure 5-4. 1C Internal Cable Plug Mechanical Dimensions

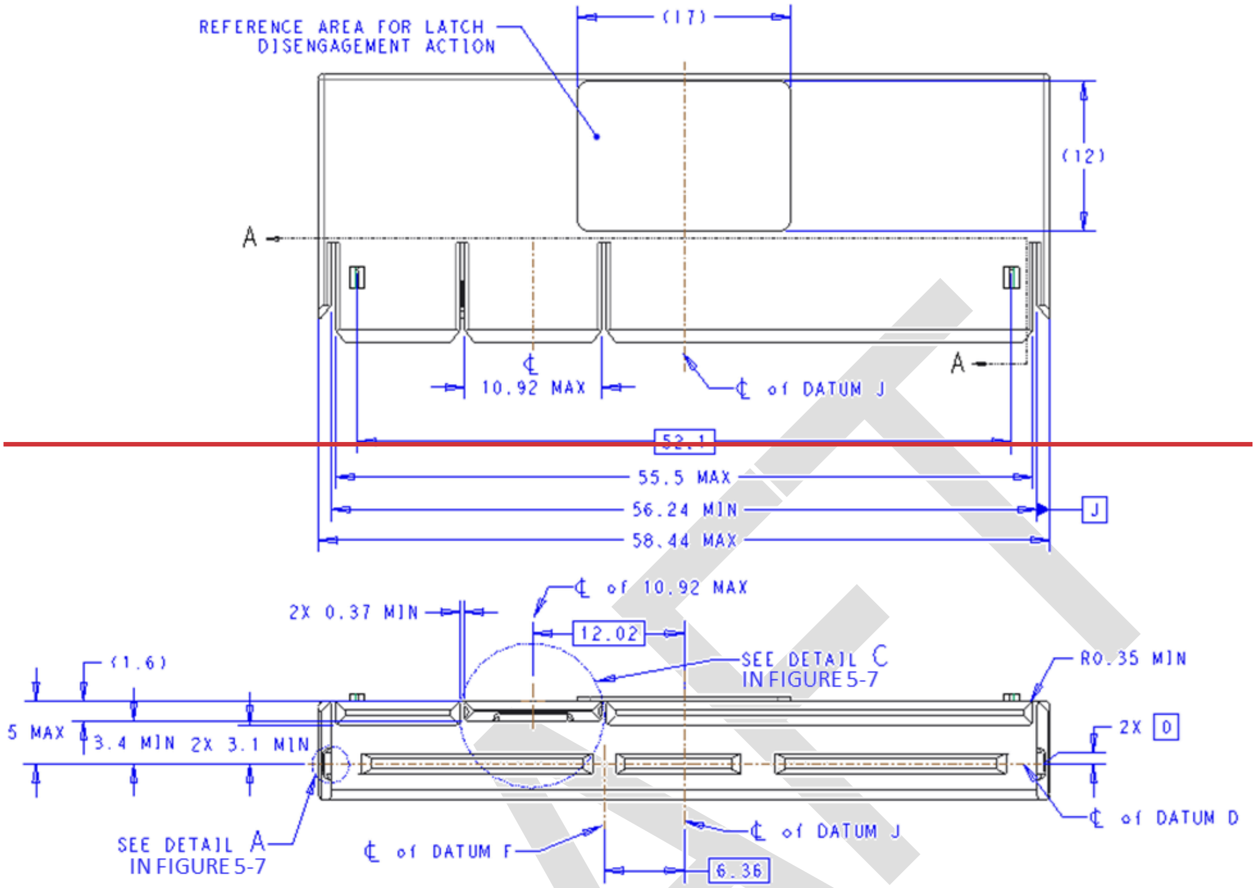

REFERENCE AREA FOR LATCH DISENGAGEMENT ACTION
(17)
℄ of DATUM J
(12)
A
A
℄
10.92 MAX
30.8
34.08 MAX
34.82 MIN
J
37.02 MAX
SEE DETAIL C
IN FIGURE 5-7
℄ of 10.92 MAX
2X 0.37 MIN
(1.6)
1.31
R0.35 MIN
5 MAX
3.4 MIN
2X 3.1 MIN
2X
0
SEE DETAIL A
IN FIGURE 5-7
℄ of DATUM J
℄ of DATUM F
℄ of DATUM D
4.35

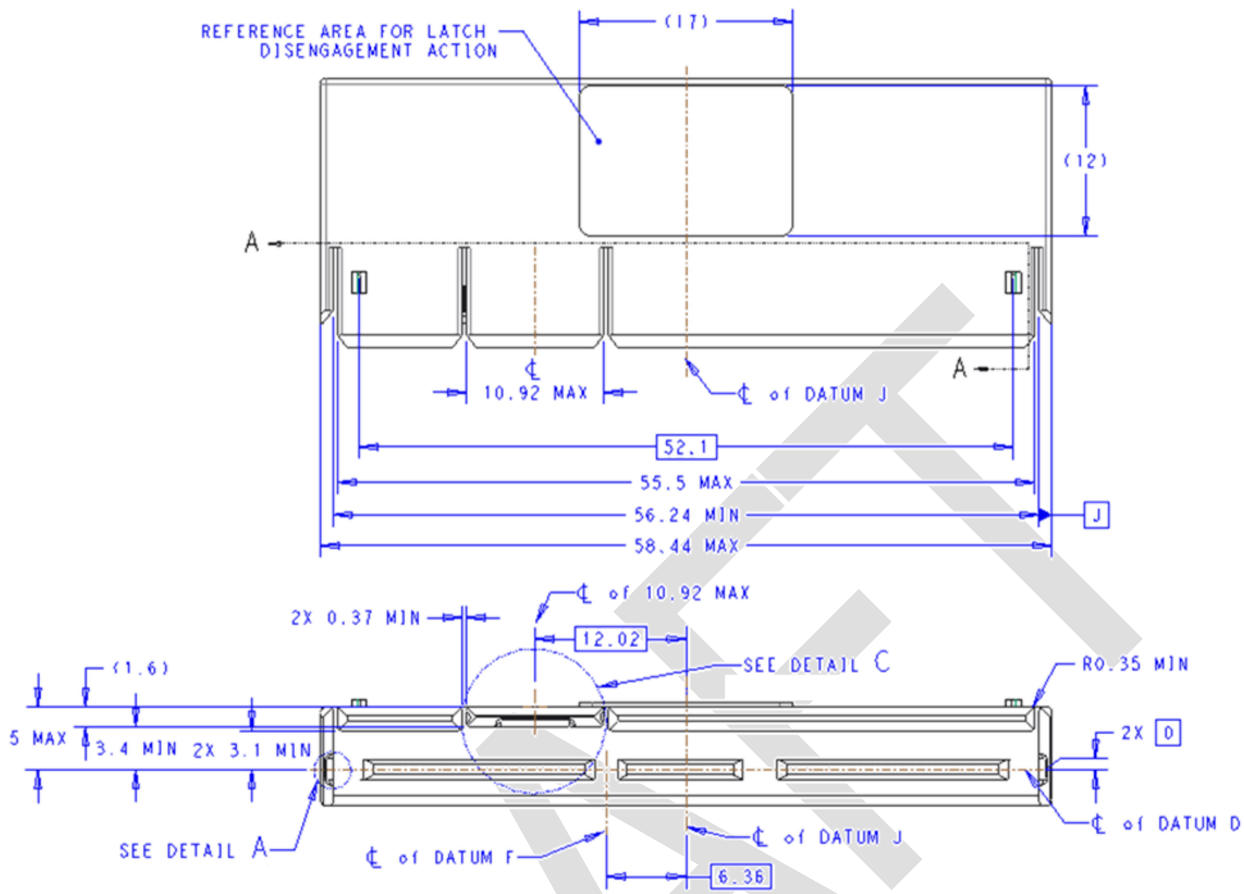
511



[Comment: See Detail A and Detail C in Figure 5-85-8~~Figure 5-8~~.]

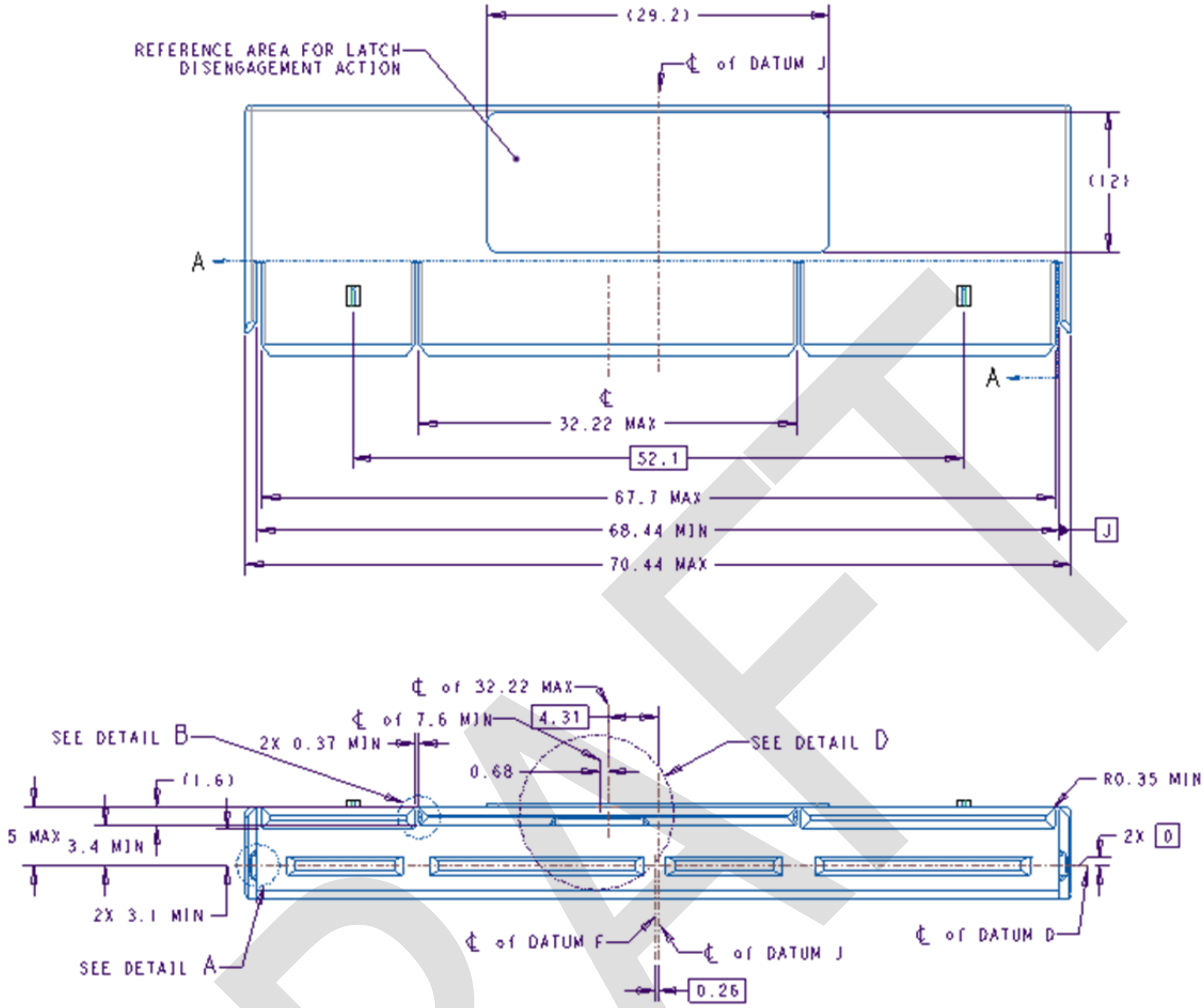
Figure 5-5. 2C Internal Cable Plug Mechanical Dimensions


REFERENCE AREA FOR LATCH DISENGAGEMENT ACTION
(17)
(12)
A
A
10.92 MAX
℄ of DATUM J
52.1
55.5 MAX
56.24 MIN
J
58.44 MAX
℄ of 10.92 MAX
2X 0.37 MIN
12.02
SEE DETAIL C
IN FIGURE 5-7
R0.35 MIN
(1.6)
5 MAX
3.4 MIN
2X 3.1 MIN
2X
D
SEE DETAIL A
IN FIGURE 5-7
℄ of DATUM F
℄ of DATUM J
℄ of DATUM D
6.36



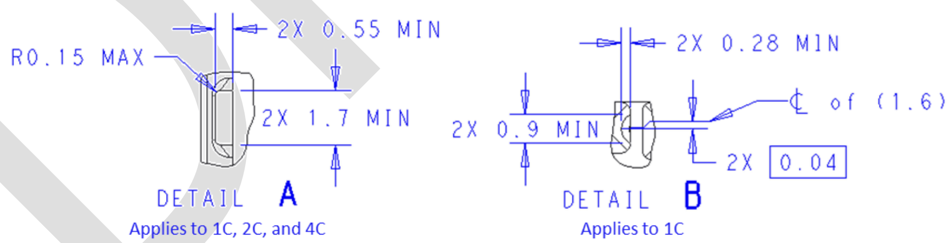
[Comment: See Detail A and Detail C in Figure 5-85-8~~Figure 5-8~~.]

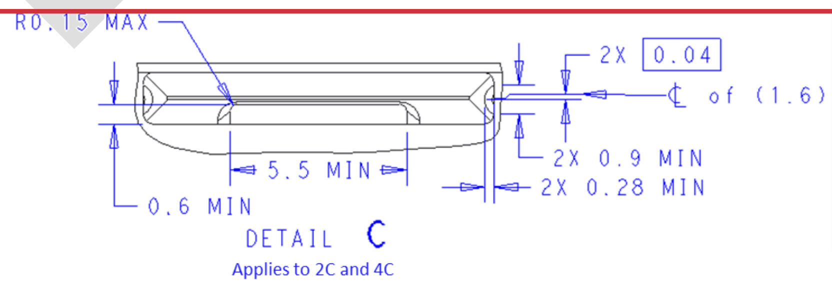
Figure 5-6. 4C Internal Cable Plug Mechanical Dimensions



[Comment: See Detail A, Detail B, and Detail D in Figure 5-85-8~~Figure 5-8~~.]

Figure 5-7. 4C+ Internal Cable Plug Mechanical Dimensions





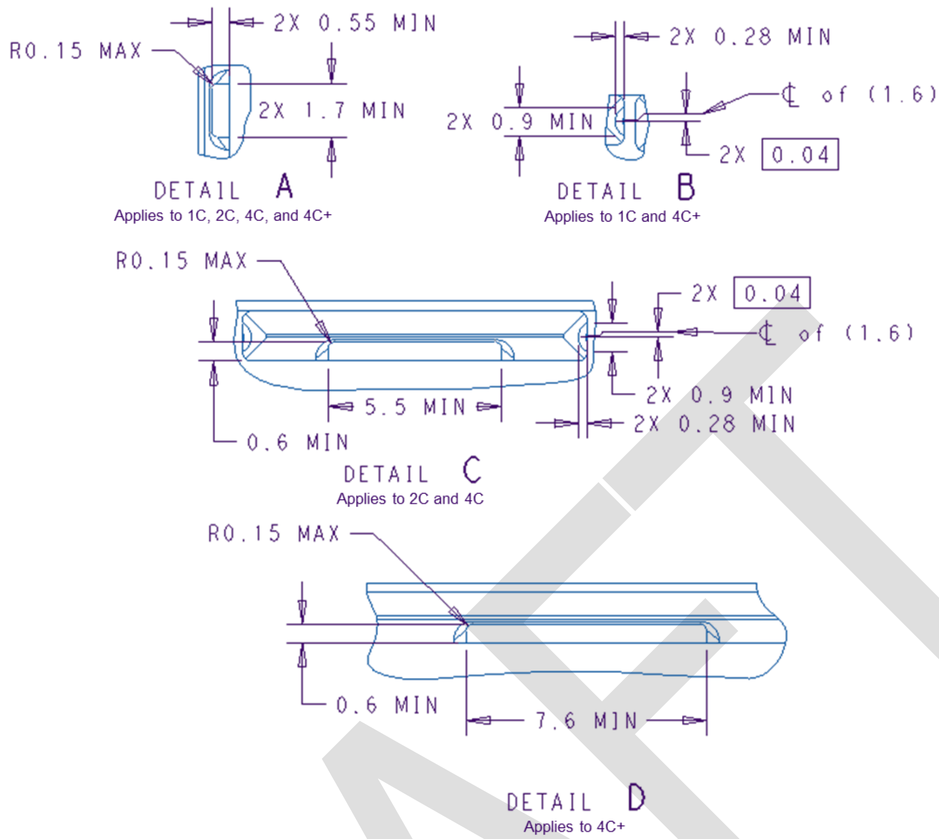


Figure 5-8~~5-8~~~~5-7~~. Internal Cable Plug Detail Views

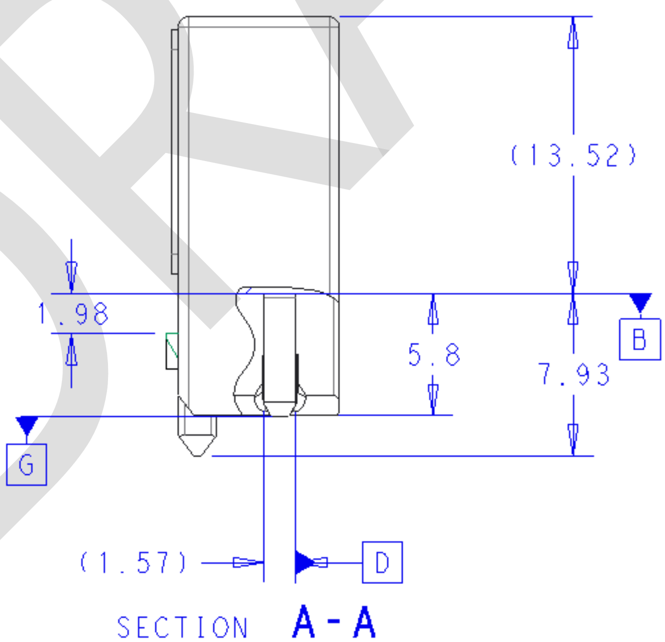


Figure 5-9~~5-9~~~~5-8~~. Side Profile Section View for Internal Cable Plug

5.2 Vertical Internal Cable Receptacle Dimensions

The following figures illustrate mechanical dimensions of the vertical internal cable receptacles. Note: Datum J applies to the cable receptacle housing and Datum C applies to the connector body.

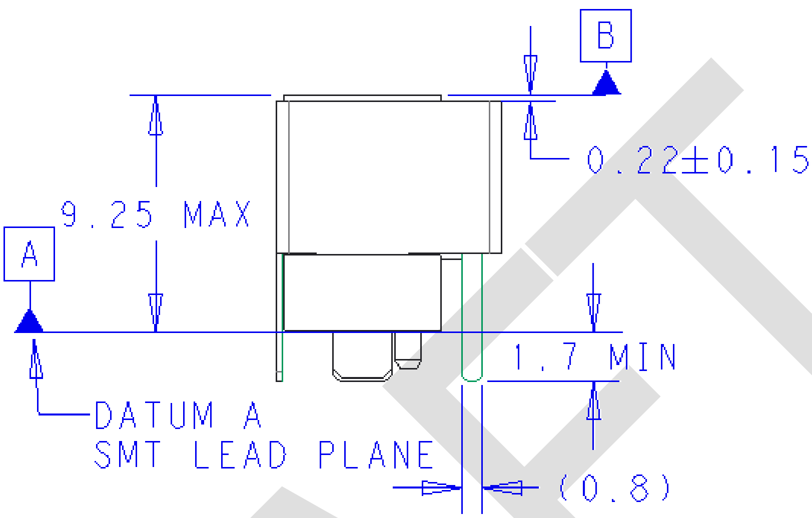


Figure 5-105~~-105-9~~. Side Profile of Vertical Internal Cable Receptacle Mechanical Dimensions

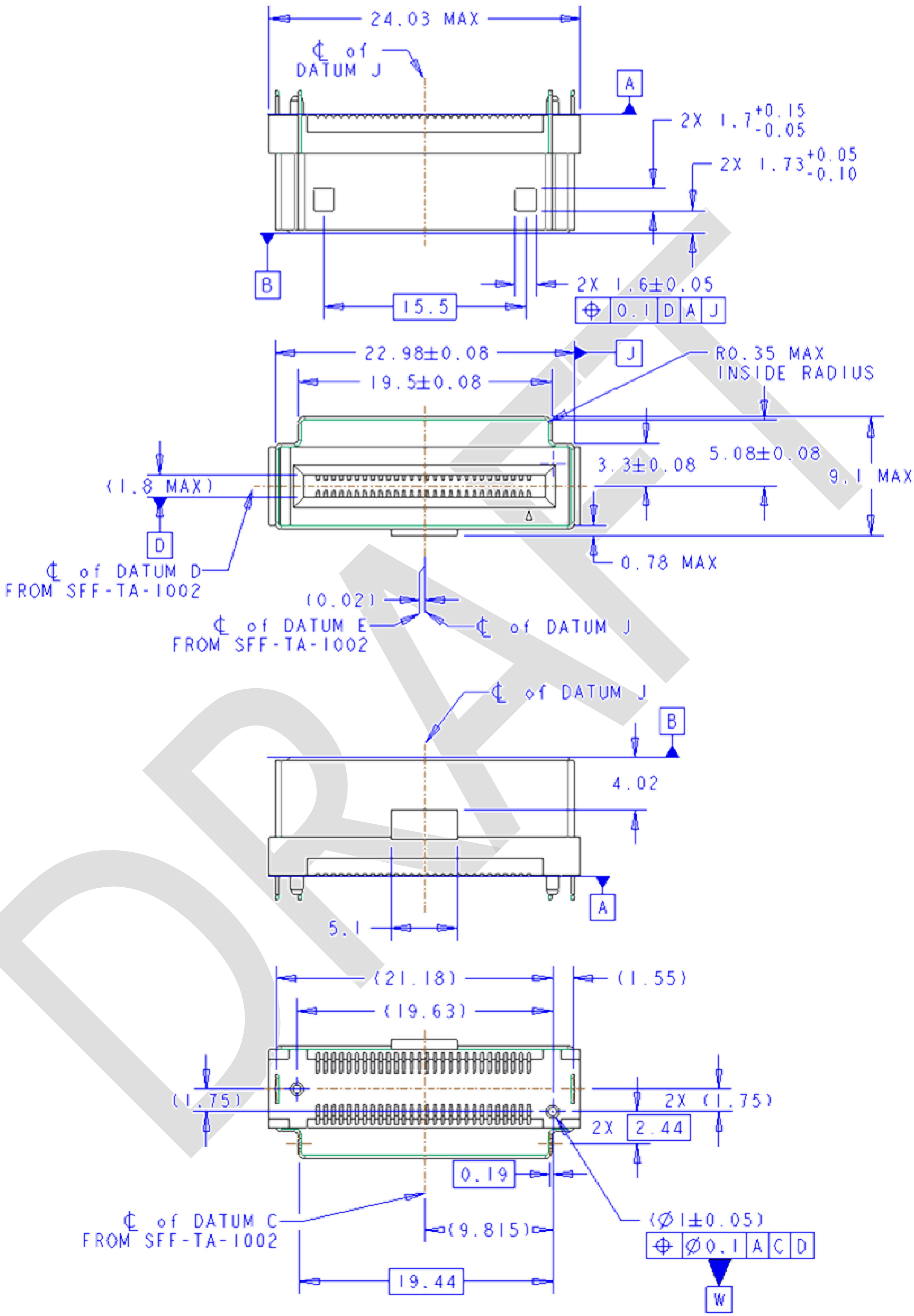


Figure 5-11~~5-115-10~~. 1C Vertical Internal Cable Receptacle Mechanical Dimensions

Note that the 1C vertical internal cable receptacle as originally defined in Figure 5-11~~Figure 5-11~~ is open to the possibility of reverse mating of the plug. Therefore, it is highly recommended that the features, as defined below in Figure 5-12, be used to prevent reverse mating.

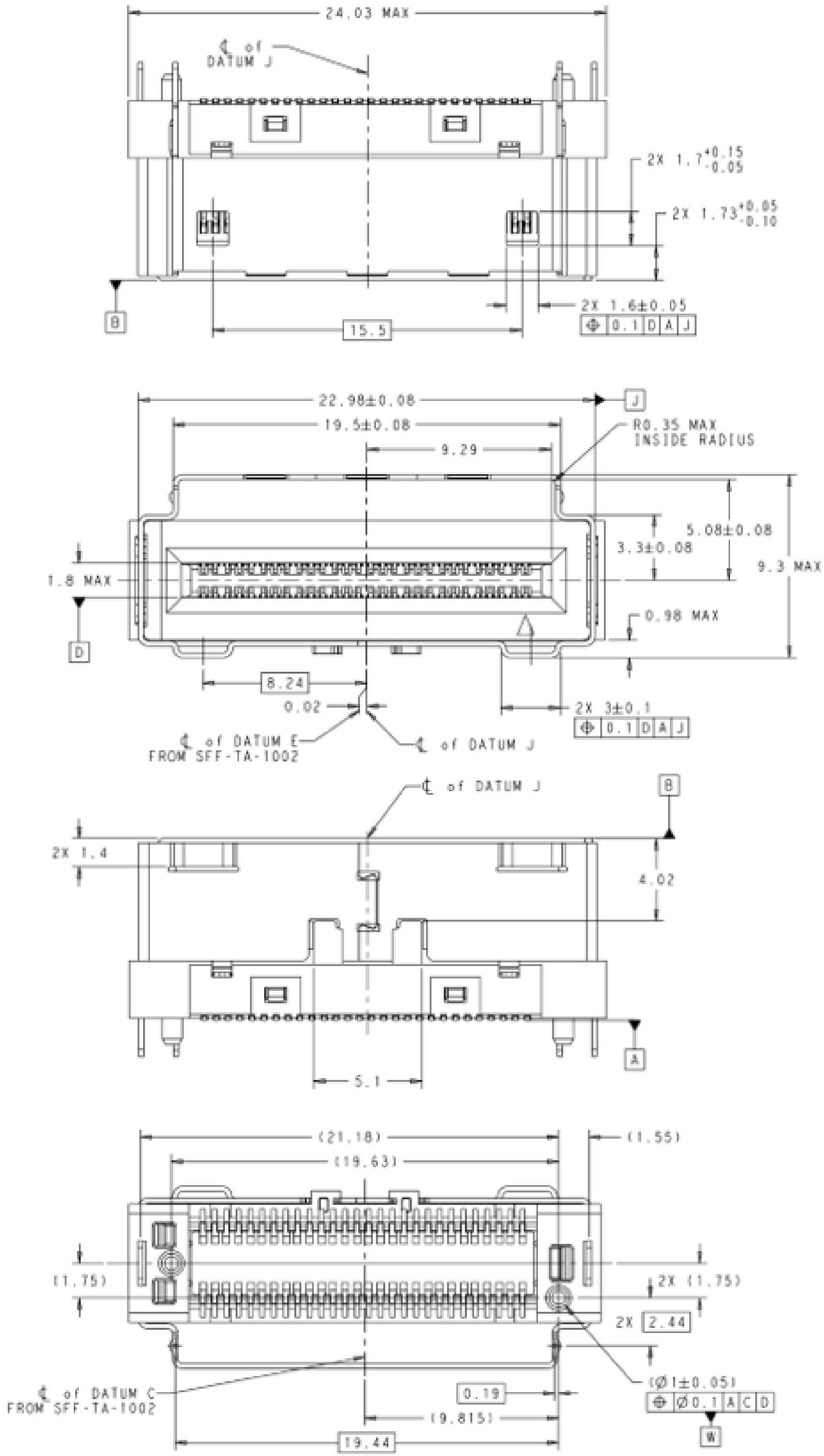


Figure 5-12 Alternative 1C Vertical Cable Receptacle with Reverse proof Features

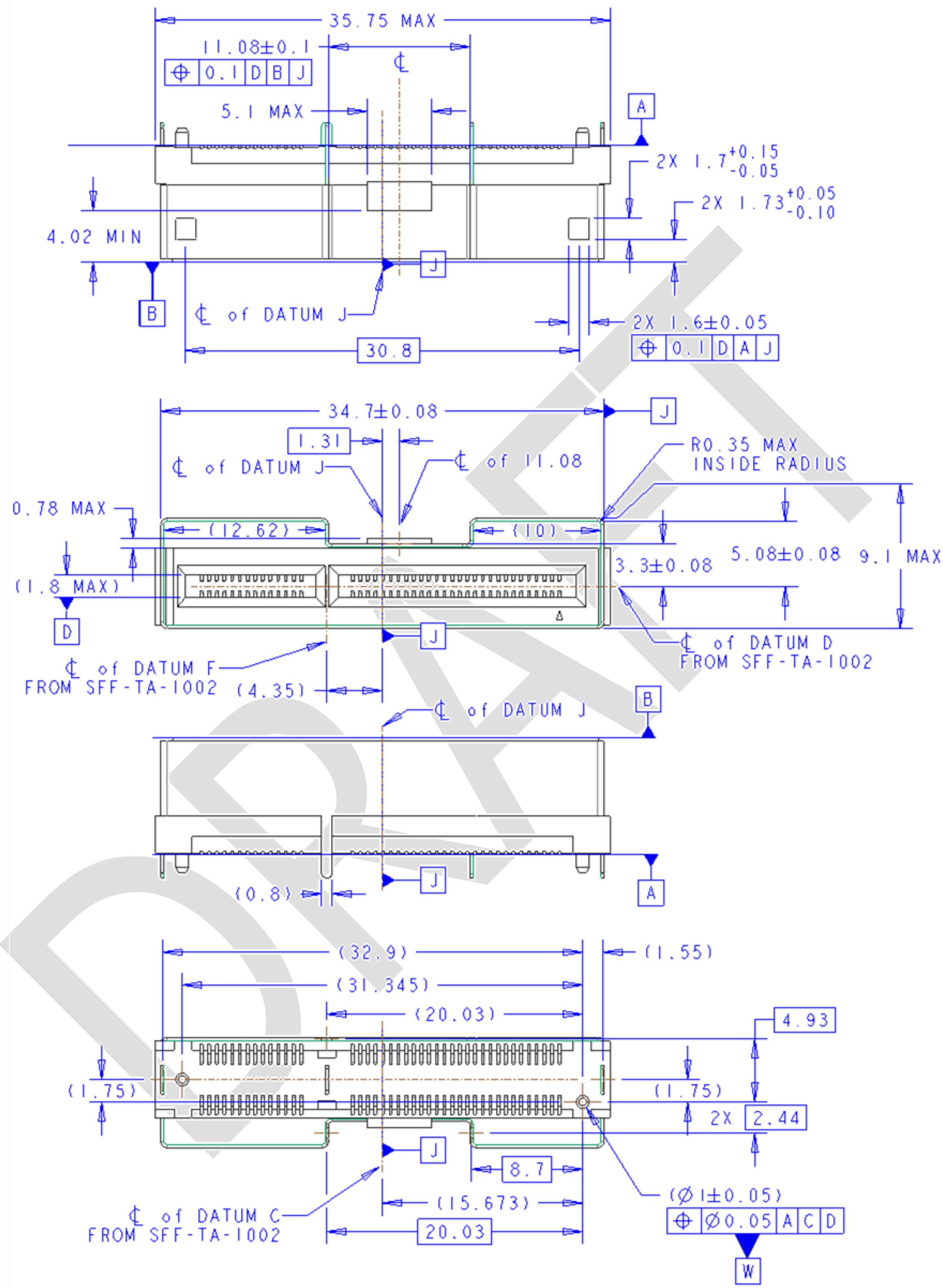


Figure 5-135-~~12~~5-~~11~~. 2C Vertical Internal Cable Receptacle Mechanical Dimensions

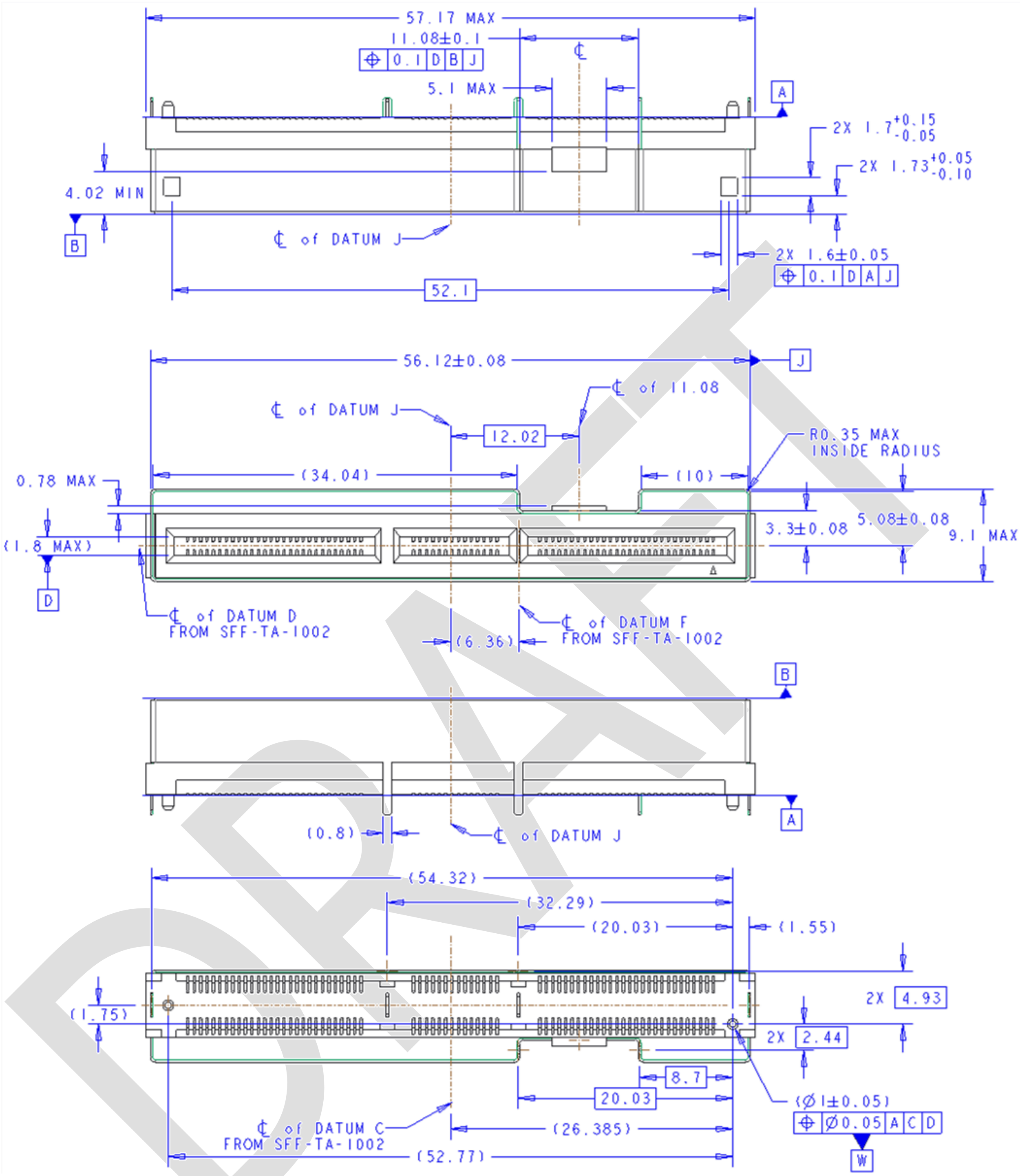


Figure 5-145-~~13~~5-~~12~~. 4C Vertical Internal Cable Receptacle Mechanical Dimensions

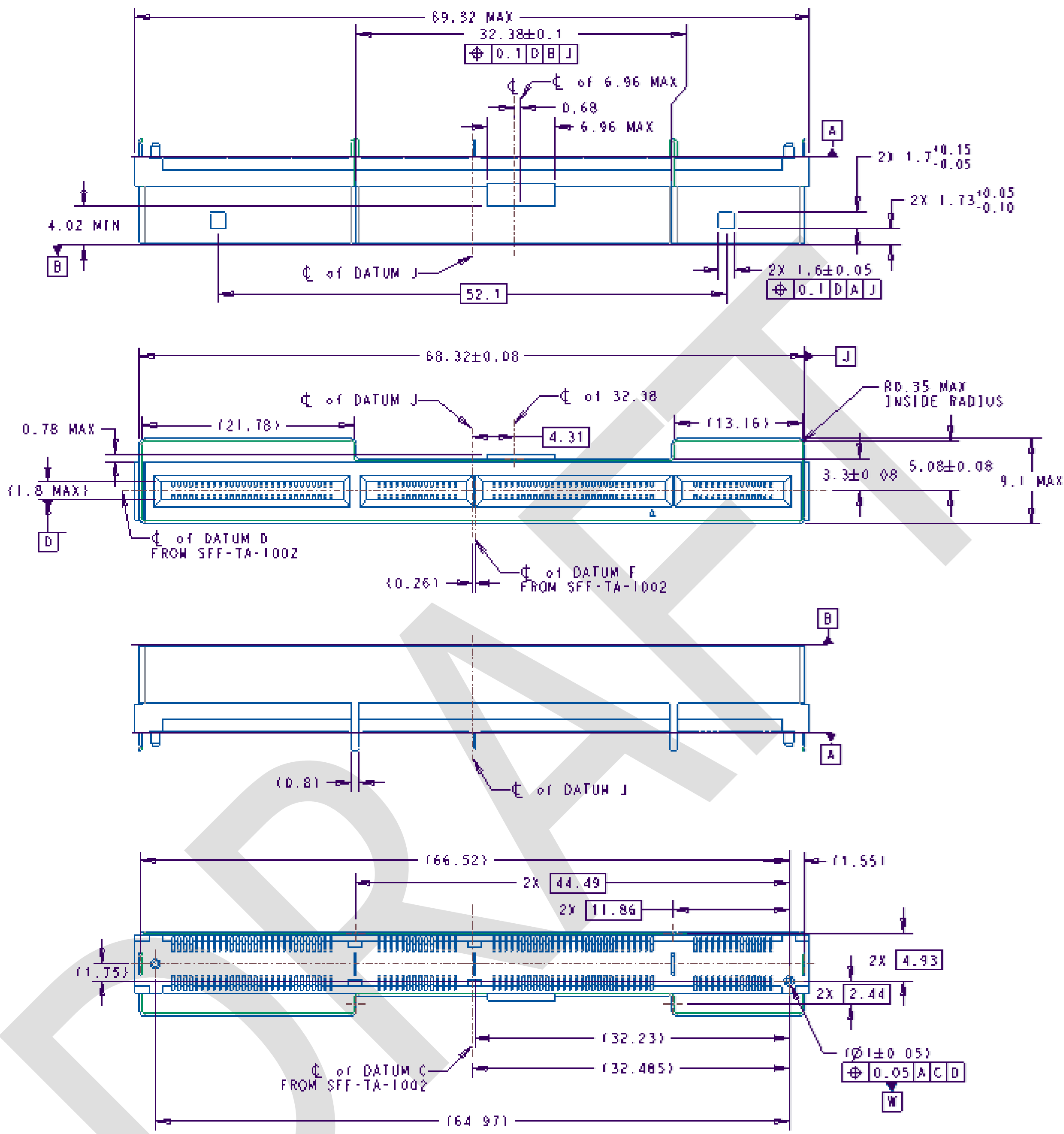


Figure 5-15~~5-14~~. 4C+ Vertical Internal Cable Receptacle Mechanical Dimensions

5.3 Right Angle Internal Cable Receptacle Dimensions

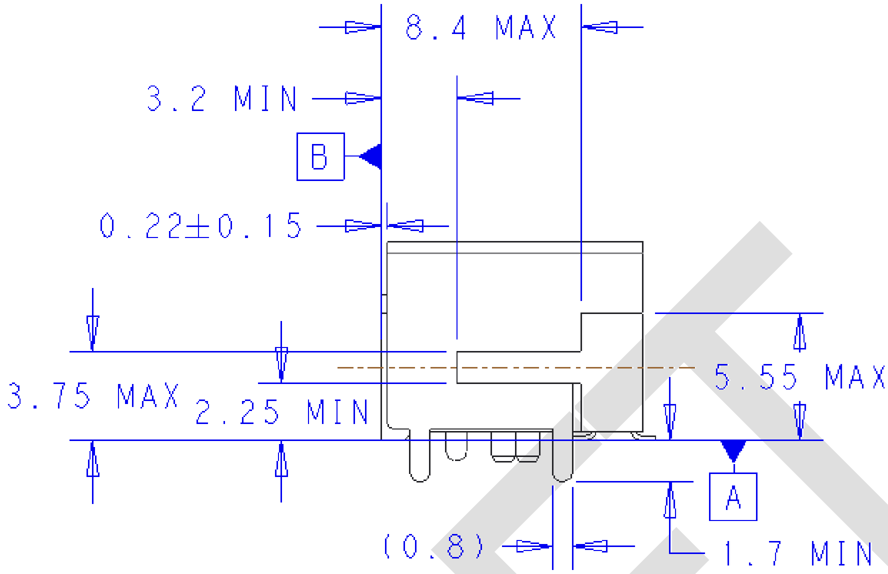


Figure 5-165~~-15~~5~~-13~~. Side Profile of Right Angle Internal Cable Receptacle Mechanical Dimensions

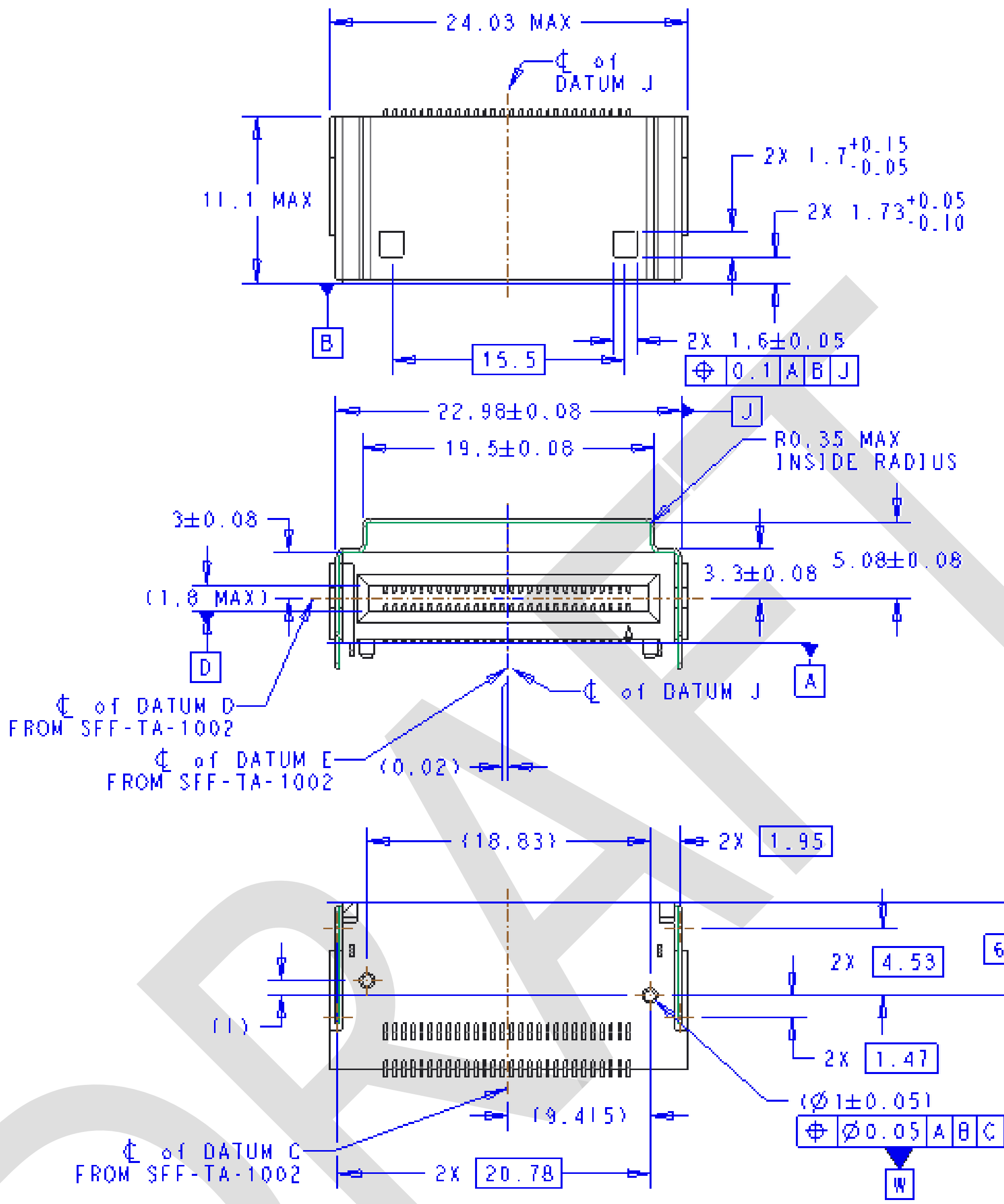


Figure 5-175-165-14. 1C Right Angle Internal Cable Receptacle Mechanical Dimensions

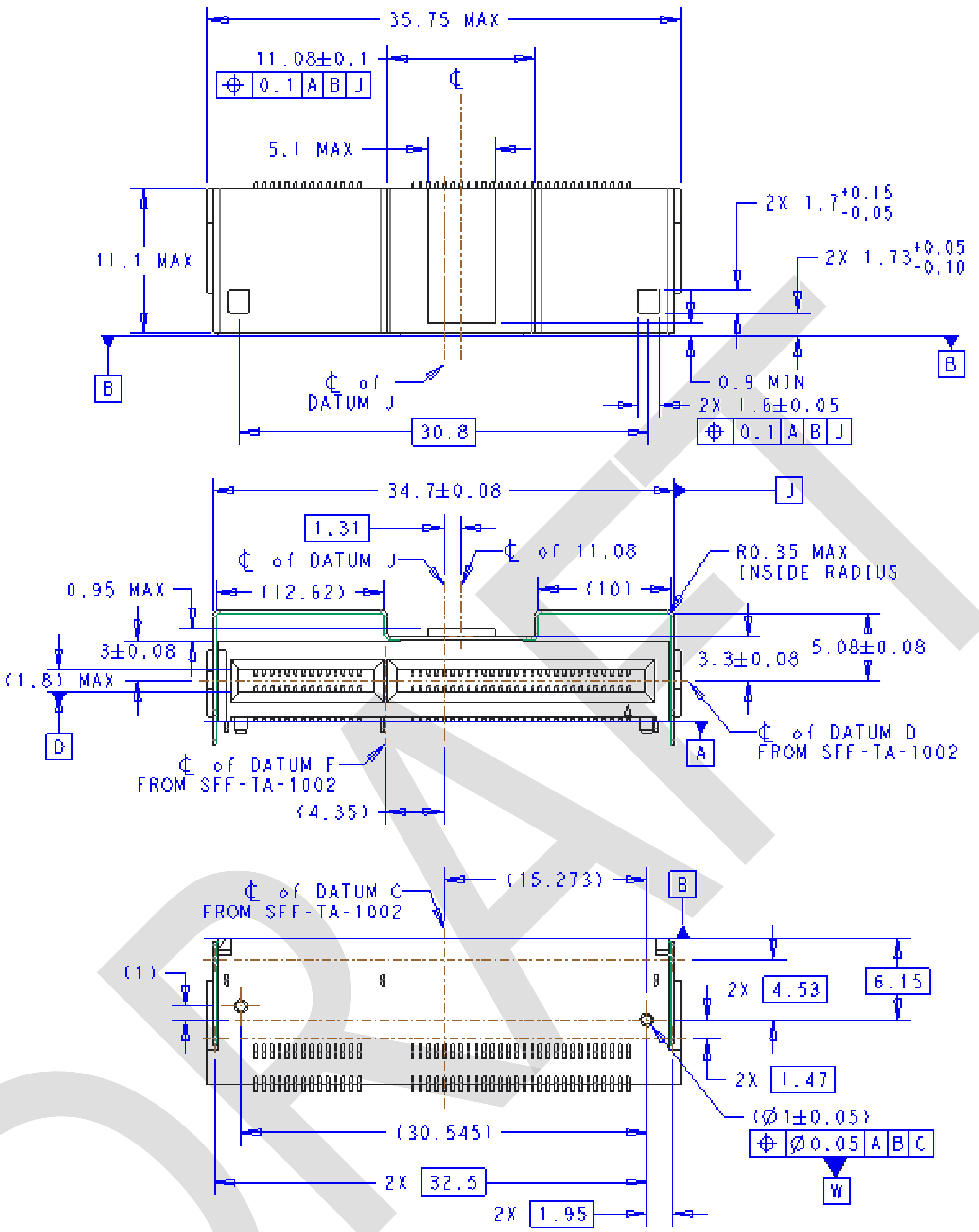


Figure 5-18~~5-175-15~~. 2C Right Angle Internal Cable Receptacle Mechanical Dimensions

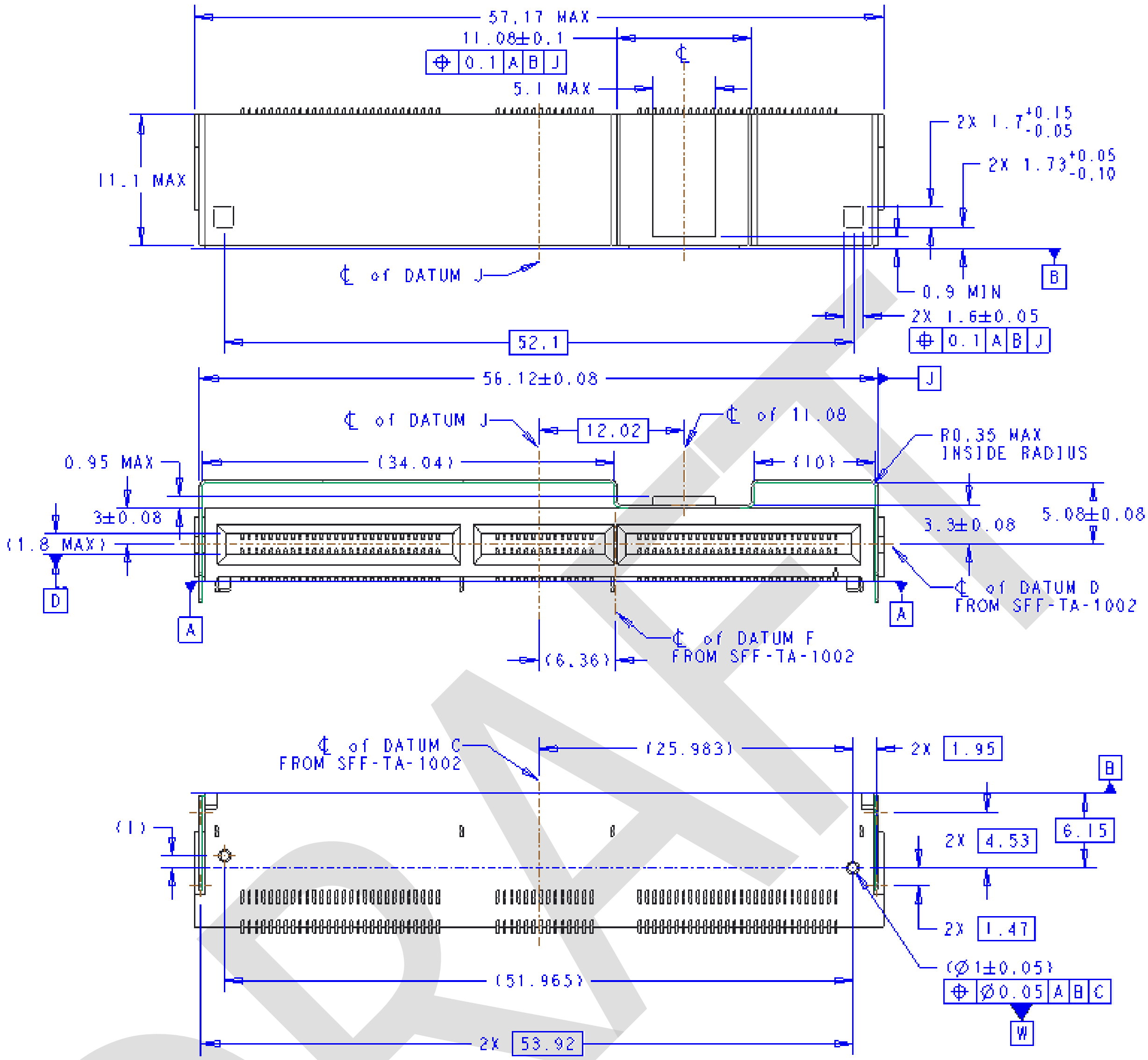


Figure 5-19~~5-18~~~~5-16~~. 4C Right Angle Internal Cable Receptacle Mechanical Dimensions

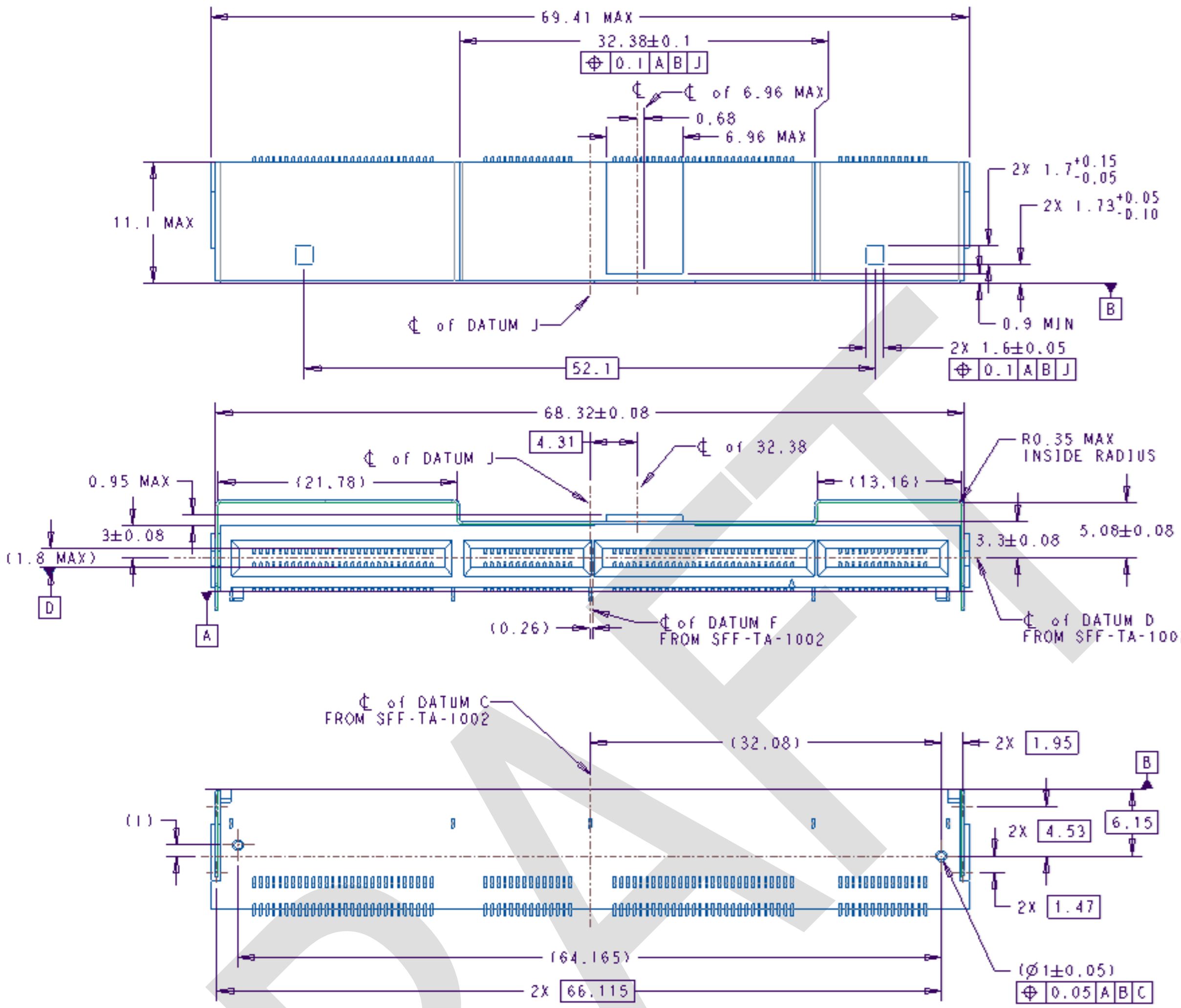


Figure 5-20~~5-19~~. 4C+ Right Angle Internal Cable Receptacle Mechanical Dimensions

5.4 28 Pin Cable Requirements

The 28 Pin internal cable configuration is based on the 28 position section that is defined within the 2C, 4C, and 4C+ configurations. This section defines the 28 pin cable plug, vertical 28 pin cable receptacle, and the right angle 28 pin cable receptacle dimensions. Refer to SFF-TA-1002 for all electrical and signal integrity requirements unless otherwise specified.

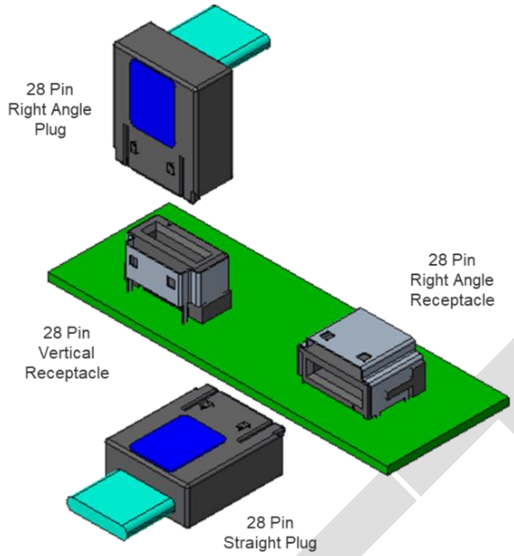
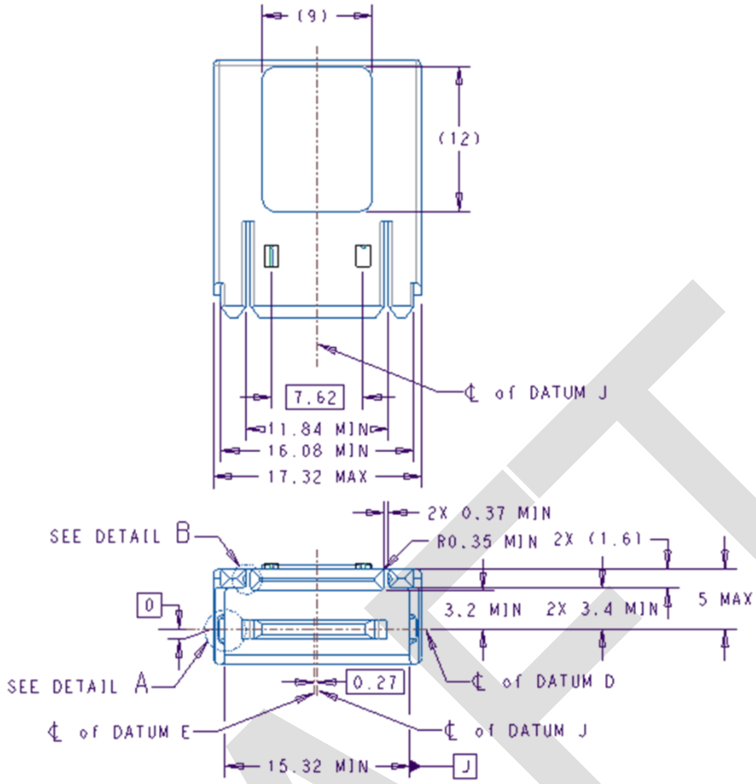


Figure 5-21~~5-20~~. General View of 28 Pin Cable to Board Configurations

5.4.1 Internal 28 Pin Cable Plug Dimensions

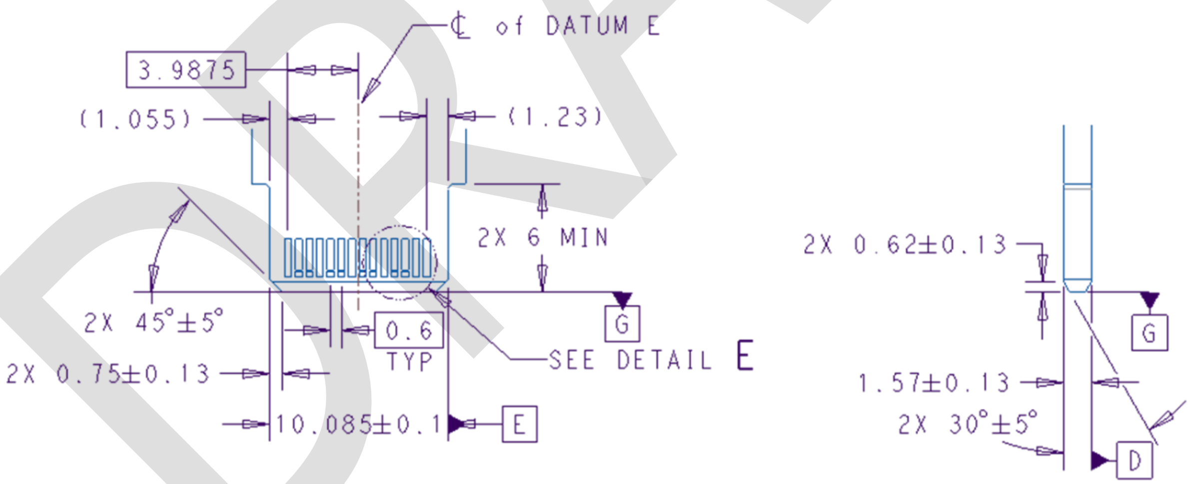
The internal 28 pin cable plug shares the same straight and right angle internal cable exits as illustrated in Figure 5-1~~Figure 5-1~~. This cable plug will also be consistent with the side profile envelope illustrated in Figure 5-2. This cable plug may also support a variant of an alternative push button / pull tab as illustrated in Figure 5-3~~Figure 5-3~~. The side profile view illustrated in Figure 5-95-95-8~~Figure 5-9~~ shall also be followed. See Section 5.1 above for these details.

Unless otherwise specified, the typical tolerance is +/- 0.13mm.



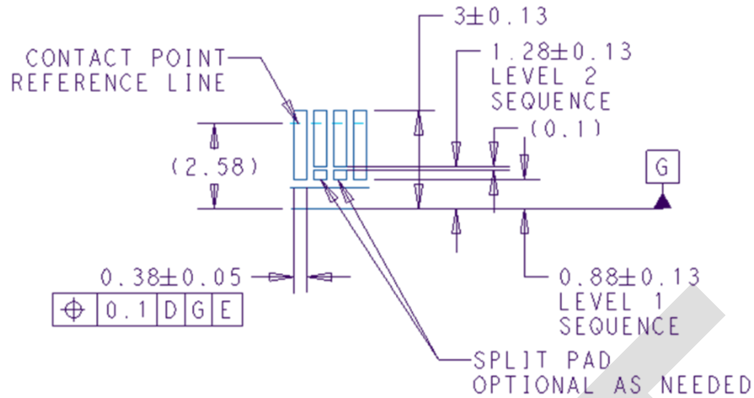
[Comment: See Detail A and Detail B in Figure 5-8~~Figure 5-8~~.]

Figure 5-22~~5-21~~. 28 Pin Internal Cable Plug Mechanical Dimensions



Notes: Position A1 on opposite side of card of B1. Dimensions for pad locations are to center of the pad.

Figure 5-23~~5-22~~. 28 Pin Plug Mating Interface Dimensions



Notes: Detail shown for reference only. Pad dimensions and sequencing levels shall be consistent with 1C AIC Pad Dimensions defined per SFF-TA-1002. If a discrepancy should exist between this figure and SFF-TA-1002, then SFF-TA-1002 takes precedence.

Figure 5-24~~5-23~~. Detail E (Reference): 28 Pin Pad Dimensions (Optional Split Pad Shown)

5.4.2 Vertical Internal 28 Pin Cable Receptacle Dimensions

The following figures illustrate mechanical dimensions of the vertical internal 28 pin cable receptacle. Note: Datum J applies to the cable receptacle housing.

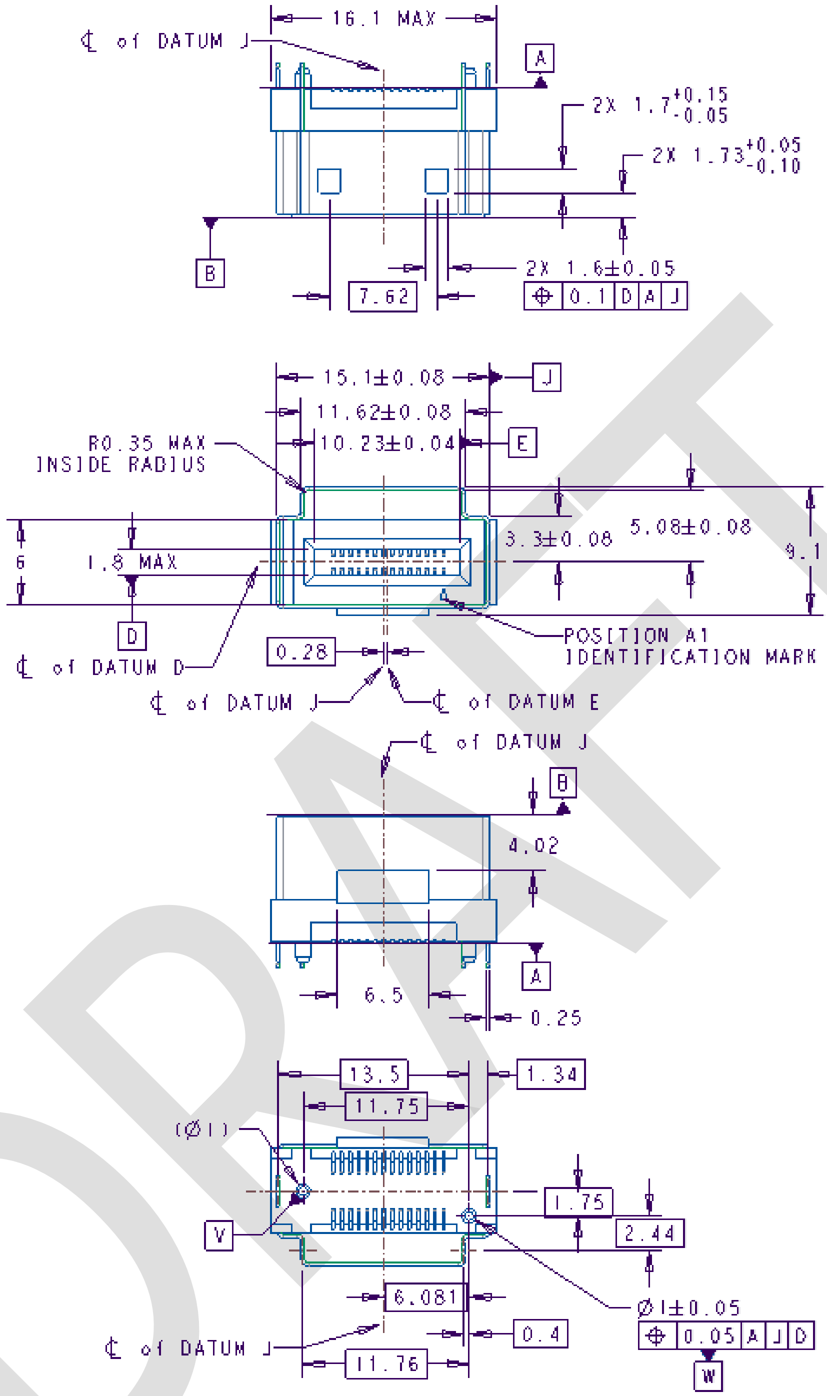


Figure 5-25~~5-24~~. 28 Pin Vertical Internal Cable Receptacle Mechanical Dimensions

The side profile view shown below for reference. Side profile shall be consistent with dimensions provided per SFF-TA-1002 figures labeled “1C, 2C, 4C AND 4C+ STRAIGHT CONNECTOR PROFILE DIMENSIONS” and “SECTION A: 1C, 2C, 4C AND 4C+ STRAIGHT CONNECTOR SEATING PLANE”. This profile will also follow Figure 5-95-95-8. Side Profile Section View for Internal Cable Plug~~Figure 5-9. Side Profile Section View for Internal Cable Plug~~ in the section above.

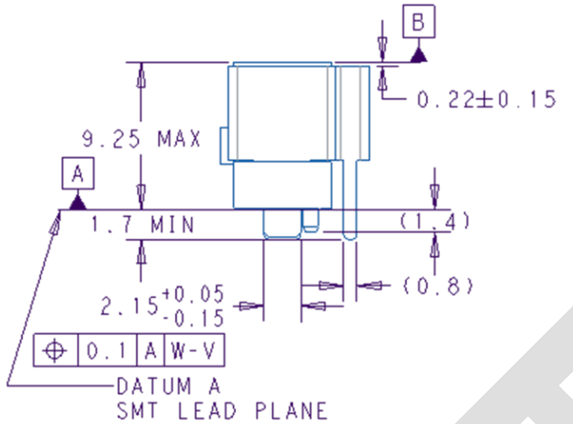


Figure 5-26~~5-25~~. Side Profile of Vertical 28 Pin Internal Cable Receptacle Mechanical Dimensions (Reference)

5.4.3 Right Angle Internal 28 Pin Cable Receptacle

The following figures illustrate mechanical dimensions of the right angle internal 28 pin cable receptacle. Note: Datum J applies to the cable receptacle housing.

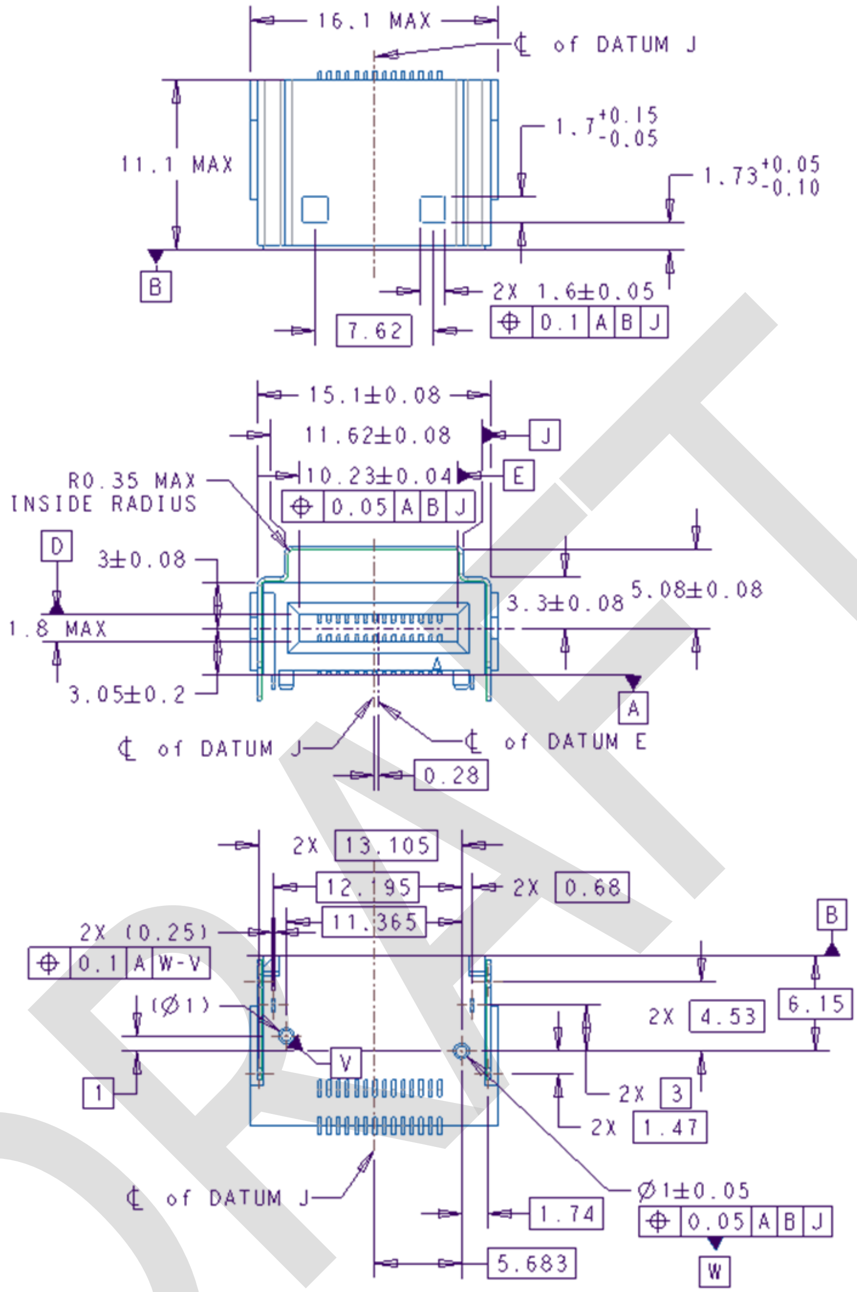


Figure 5-27~~5-26~~. 28 Pin Right Angle Internal Cable Receptacle Mechanical Dimensions

The side profile view shown below is for reference. Side profile shall be consistent with dimension provided per SFF-TA-1002 figures labeled "1C, 2C, 4C AND 4C+ RIGHT ANGLE CONNECTOR PROFILE DIMENSIONS" and "SECTION A: 1C, 2C, 4C AND 4C+ RIGHT ANGLE CONNECTOR SEATING PLANE". This profile will also follow Figure 5-165-155-13. Side Profile of Right Angle Internal Cable Receptacle Mechanical Dimensions~~Figure 5-15. Side Profile of Right Angle Internal Cable Receptacle Mechanical Dimensions~~ in the section above.

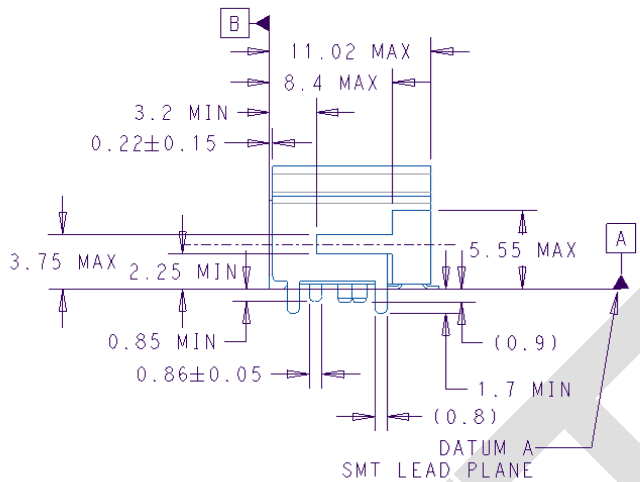


Figure 5-28~~5-27~~. Side Profile of Right Angle 28 Pin Internal Cable Receptacle Mechanical Dimensions (Reference)

5.4.4 Outer Locus of the 28 Pin Connector Mating Contacts

Figure 5-295-28~~Figure 5-28~~ show the outer locus of the connector contacts at the cable plug mating interface.

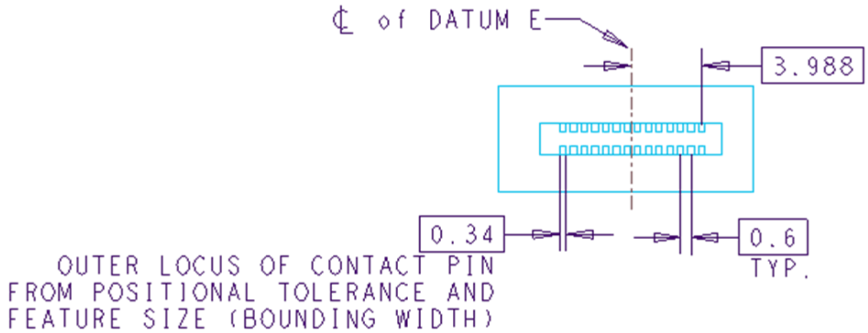


Figure 5-295~~-28~~. 28 Pin Outer Locus of Connector Contact Pin

5.4.5 Outer Locus of SMT Leads

Both **Figure 5-305-29~~Figure 5-29~~** and **Figure 5-315-30~~Figure 5-30~~** show the outer locus of the flat surfaces of the connector SMT leads.

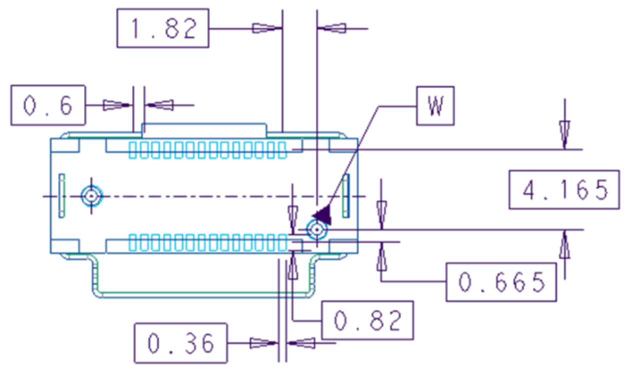


Figure 5-305~~-29~~. 28 Pin Straight Outer Locus of Connector SMT Leads

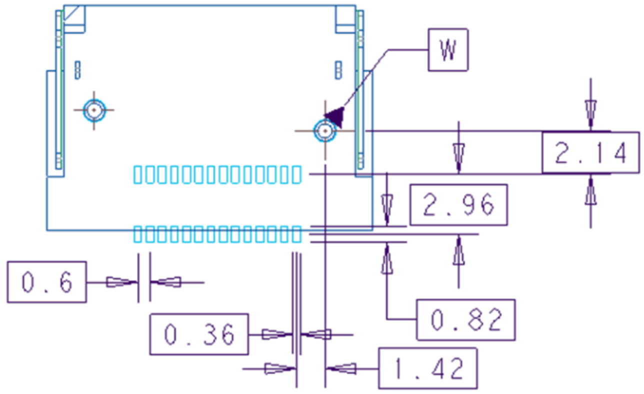


Figure 5-31~~5-30~~. 28 Pin Right Angle Outer Locus of Connector SMT Leads

~~5.4~~5.5 Cable Mechanical Performance & Reliability

The following specifies the reliability testing requirements of internal cables receptacles and plugs. Unless otherwise specified in this section, the receptacles and plugs shall meet all reliability and mechanical testing requirements specified in *SFF-TA-1002*.

662 **Table 5-1. Internal Cable Assembly Test Sequence**

Test	Test Group 1	Test Group 2	Test Group 3	Test Group 4
Low Level Contact Resistance	1,6	1,4,6	1,3,5,7	1,4,6
Durability (preconditioning)	2	2		2
Durability Cycles	3			3
Axial Latch Retention	4	5		5
Longitudinal Force	5	4	6	8
Mechanical Shock		3	4	7
Vibration			2	

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664 **Table 5-2. Internal Cable Assembly Test Conditions**

Reliability Test Description	Procedure	Requirement
Durability (preconditioning)	EIA-364-09, perform 5 plug/unplug cycles	No evidence of physical damage
Temperature Life (preconditioning)	60°C field temperature. Test Temperature and Test Duration per EIA 364-1000 Table 9	No evidence of physical damage
Low Level Contact Resistance (LLCR)	EIA-364-23 (termination of connector to board carrier shall be included in the measurements)	Refer to EIA-364-23, Table 5.4.2. LLCR Initial: 30mΩ Delta: 15mΩ
Mechanical Shock	EIA-364-27	- No damage - 20mΩ maximum change from initial (baseline) contact resistance
Vibration	EIA-364 -28	- No discontinuities of ≥ 1 microsecond - No damage - 20mΩ maximum change from initial (baseline) contact resistance
Axial Latch Retention	Pull in direction parallel to insertion, hold for minimum of 60 seconds	50N, no damage
Latitudinal/ Longitudinal Pull Force	25N applied perpendicular to mating interface. 360 degrees in 45 degree increments, beginning perpendicular to long end of the connector body.	-Monitor LLCR, no discontinuities - No damage - 20mΩ maximum change from initial (baseline) contact resistance

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666

Table 5-3. Internal Cable Assembly Additional Requirements

Description	Procedure	Requirement
Mating Force	EIA-364-13	SFF-TA-1002 Requirements + 10N MAX
Durability Cycles	EIA-364-30	25 cycles min
Storage Temperature	N/A	-20°C to +85°C degrees
Humidity		80% Relative Humidity

Requirements and attributes not specified in this section or in *SFF-TA-1002* shall specified by the manufacturer of the internal cable receptacle or internal cable plug assembly.

6. 4C-HP Connector Requirements

This section specifies a variation of the SFF-TA-1002 connector that adds an additional high-power interface to the 4C interface. 4C-HP 12V/48V High-Power Connector General View illustrates a general view of the high-power AIC and connector. A key is used to prevent 180 degree insertion, mixing incompatible voltages of AICs and connectors, and plugging in a 4C+ AIC as specified in SFF-TA-1002.

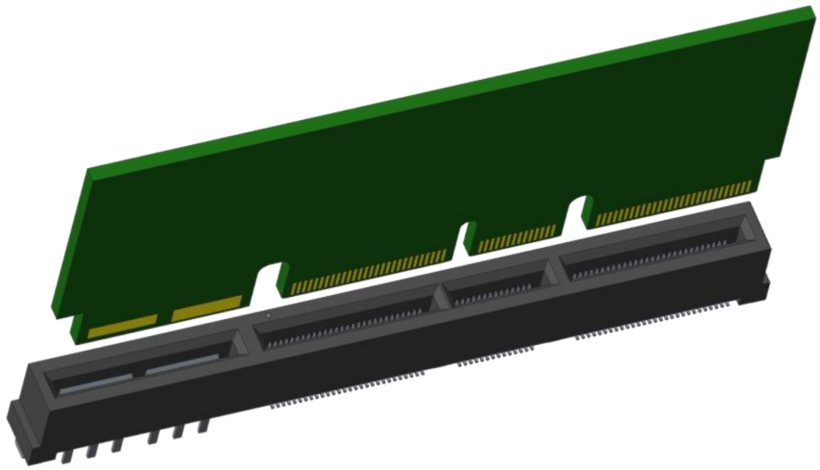


Figure 6-16-16-1. 4C-HP 12V/48V High-Power Connector General View

6.1 Mechanical Dimensions

All dimensions and tolerances are in millimeters, and conform to ASME Y14.5-2009.

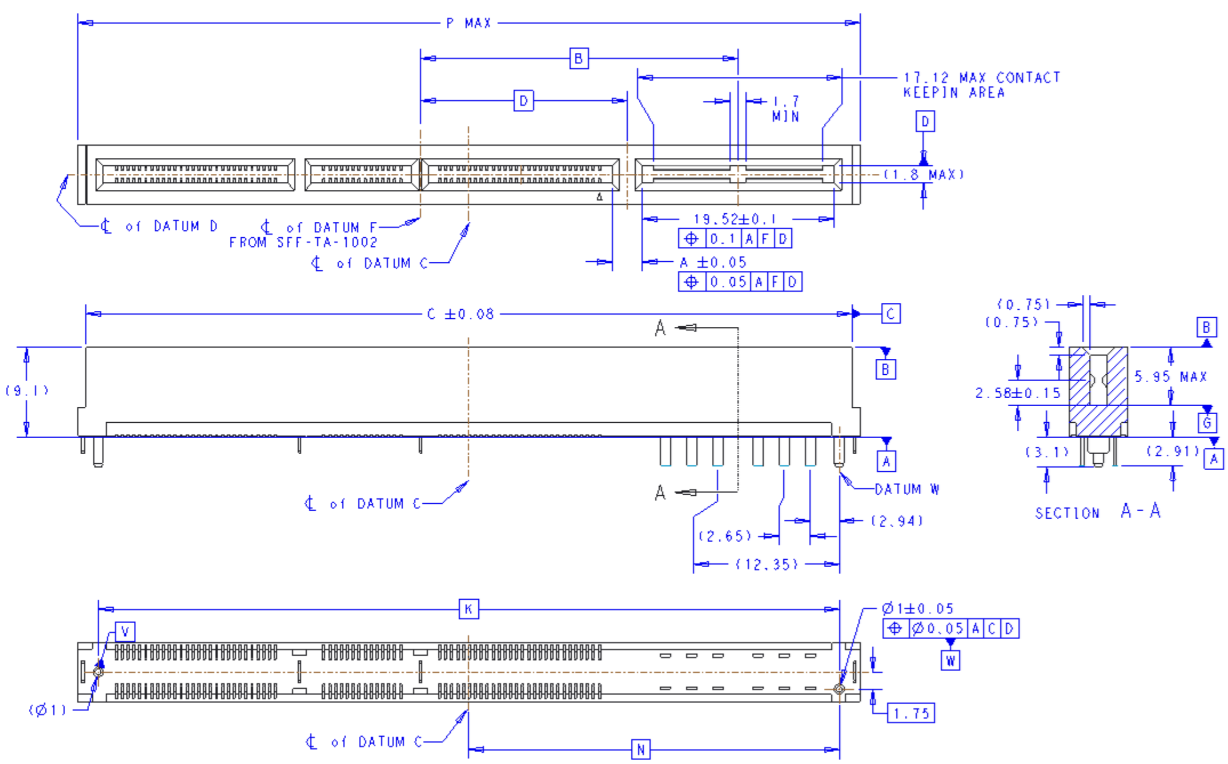


Figure 6-26-26-2. 4C-HP 12V/48V High-Power Connector Dimensions

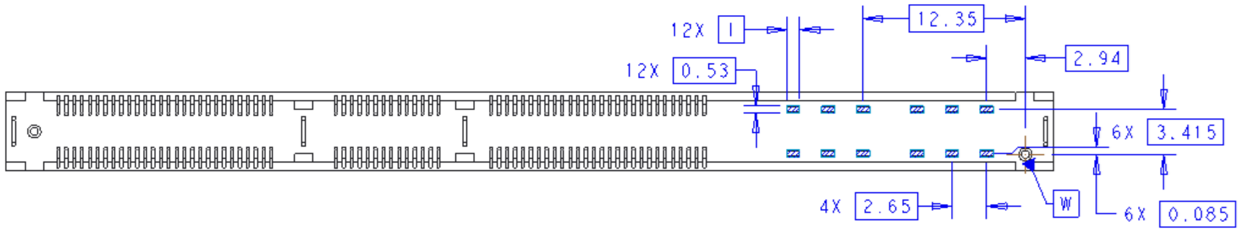
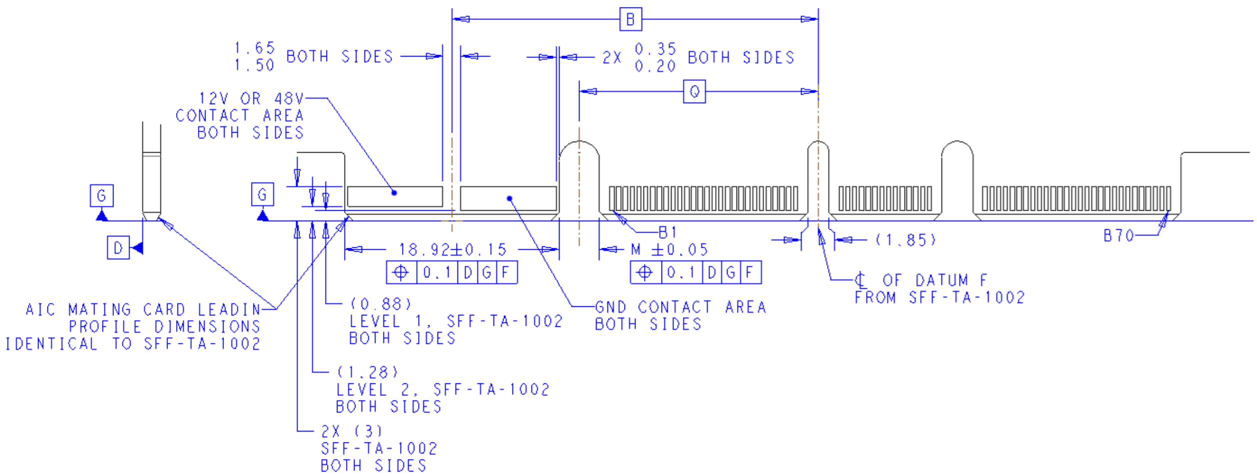


Figure 6-36-36-3. 4C-HP 12V/48V High-Power Connector Pin Locus



Note: Position A1 on opposite side of card of B1

Figure 6-46-46-4. 4C-HP 12V/48V High-Power AIC Dimensions

Table 6-1. Dimensions for High-Power 12V and 48V AICs, Connectors and Footprints

Dimension	12V AIC	48V AIC
A	3.05	4.05
B	32.31	33.31
C	77.89	78.89
D	21.03	21.53
E	24.39	25.39
F	44.60	45.60
G	57.31	58.31
H	42.60	43.60
J	54.86	55.86
K	75.34	76.34
L	76.89	77.89
M	3.57	4.57
N	37.67	38.17
P	79.74	80.74
Q	21.07	21.57

6.2 Electrical Requirements

The 4C-HP connector shall support up to 55A through the high-power connector. Refer to SFF-TA-1002 for all electrical and signal integrity requirements unless otherwise specified.

- Host designs that support the high-power interface shall provide 12V +/- 10% (10.8V to 13.2V) or 48V +/- 10% (43.2V to 52.8V) to the connector.
- 12V connectors shall support power pins specified in the 1C section and the high-power section of the connector to enable maximum of 660W at worst-case voltage conditions.
- 48V connectors shall support power only through the high-power section of the connector, i.e., not through the 1C section.

6.3 Power Sequencing Requirements

High-power AIC and hosts shall support a maximum power draw of 25W at initialization.

- A 48V AIC shall draw all power from the high-power pins, and shall not connect to any other power pins in the connector.
- A 12V AIC shall draw only from the 1C section of the connector at initialization and may draw from both the high-power pins and 1C section once enabled to draw more than 25W.

7. 280 Pin Vertical Connector

This section specifies a variation of the SFF-TA-1002 connector that contains 280 positions leveraging the *SFF-TA-1002* interface. An example use case is a 32 lane PCIe riser card. A key is used to prevent 180 degree insertion and plugging in a 2C, 4C or 4C+ AIC.

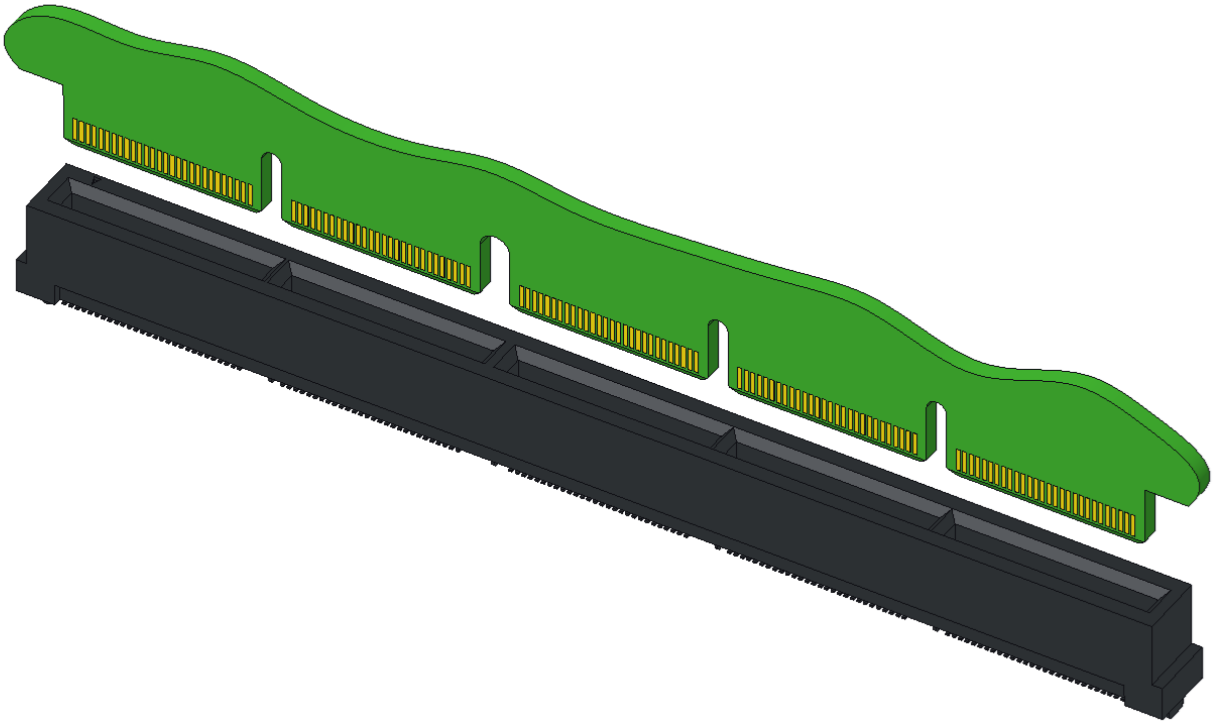


Figure 7-1~~7-1~~~~7-1~~. 280 Pin Connector General View

7.1 Mechanical Dimensions

All dimensions and tolerances are in millimeters, and conform to ASME Y14.5-2009. For dimensions not shown, reference SFF-TA-1002

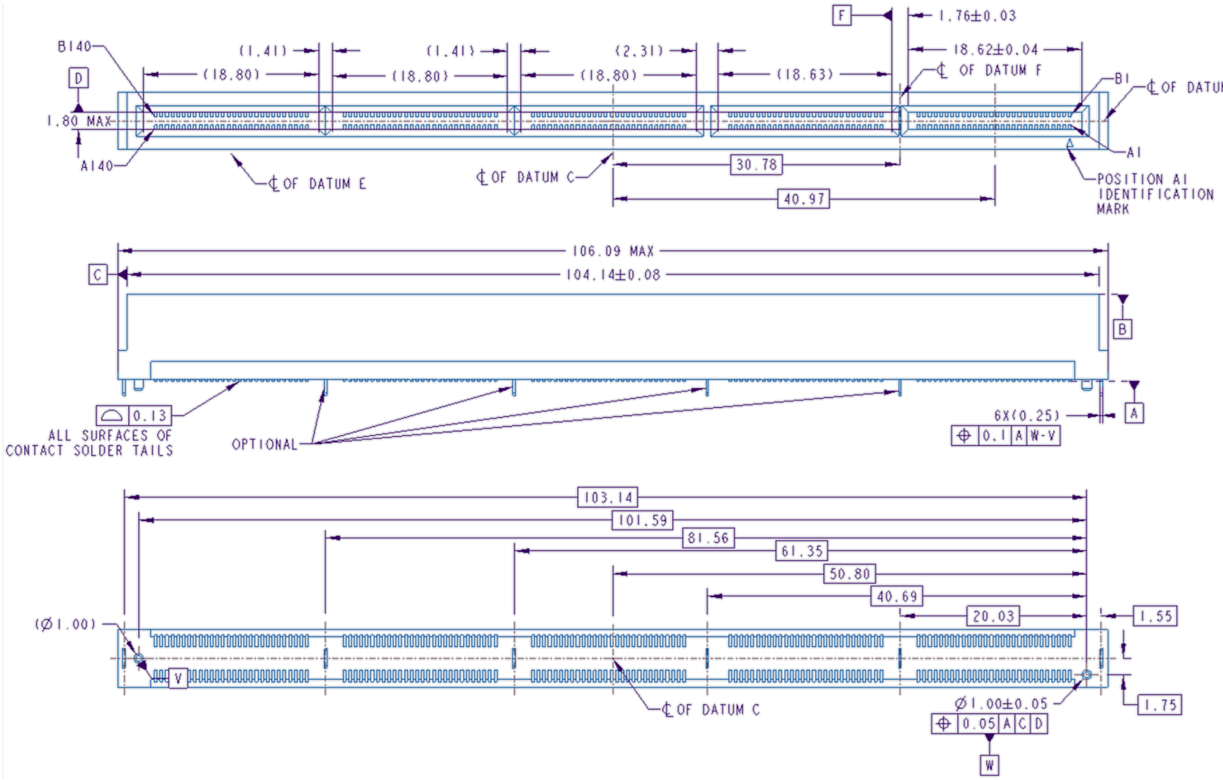


Figure 7-2~~7-2~~~~7-2~~. 280 Pin Connector Dimensions

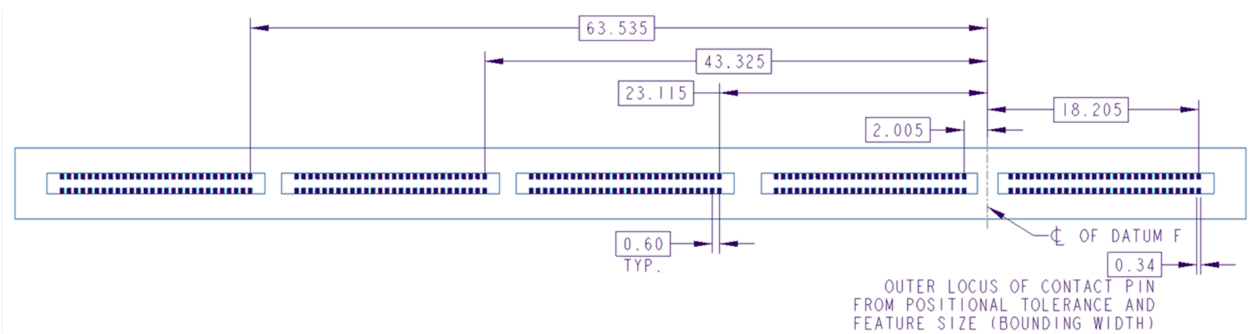


Figure 7-3~~7-3~~~~7-3~~. 280 Pin Connector Pin Locus

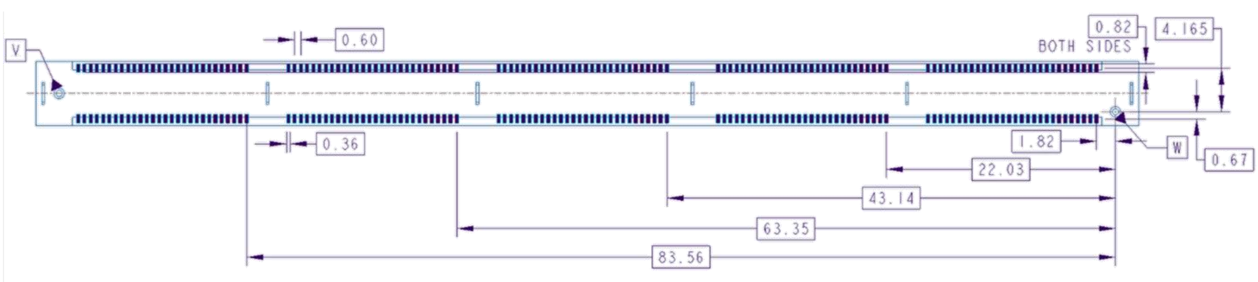


Figure 7-4~~7-4~~~~7-4~~. 280 Pin Connector SMT Lead Locus

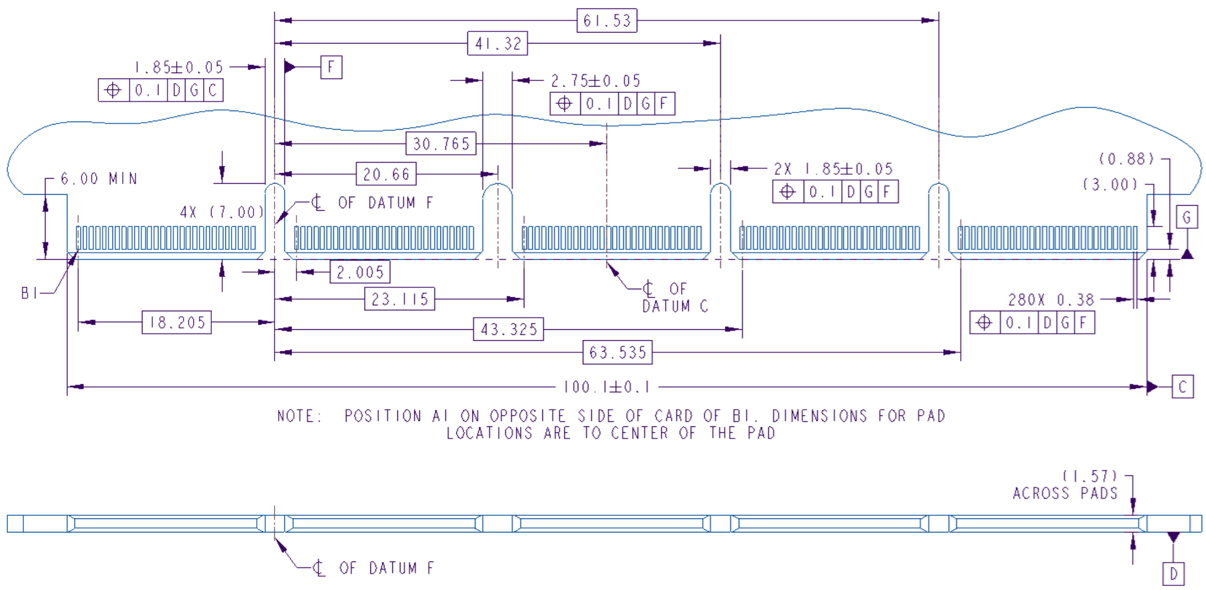


Figure 7-5~~7-5~~~~7-5~~. 280 Pin AIC Dimensions

8. 2C Connector with 2.36mm Card Edge (2C-2.36)

This section specifies a variation of the SFF-TA-1002 2C connector that utilizes a thicker card edge (2.36 mm) instead of the standard card edge thickness used by SFF-TA-1002 (1.57 mm)

8.1 Mechanical Dimensions

All dimensions and tolerances are in millimeters and conform to ASME Y14.5-2009. For dimensions not shown, reference SFF-TA-1002

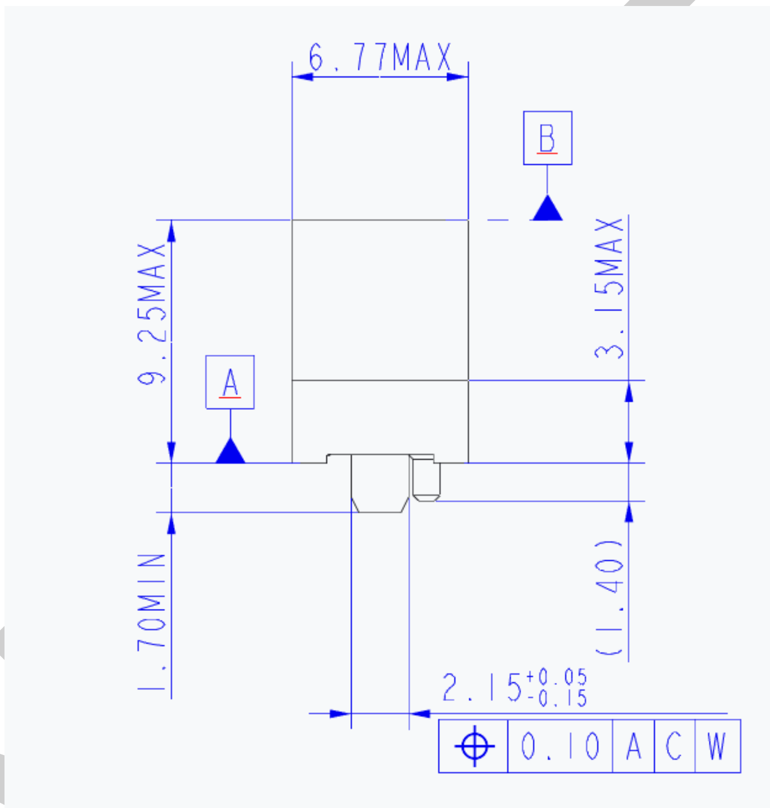


Figure 8-1. 2C-2.36 Straight Connector Profile Dimensions

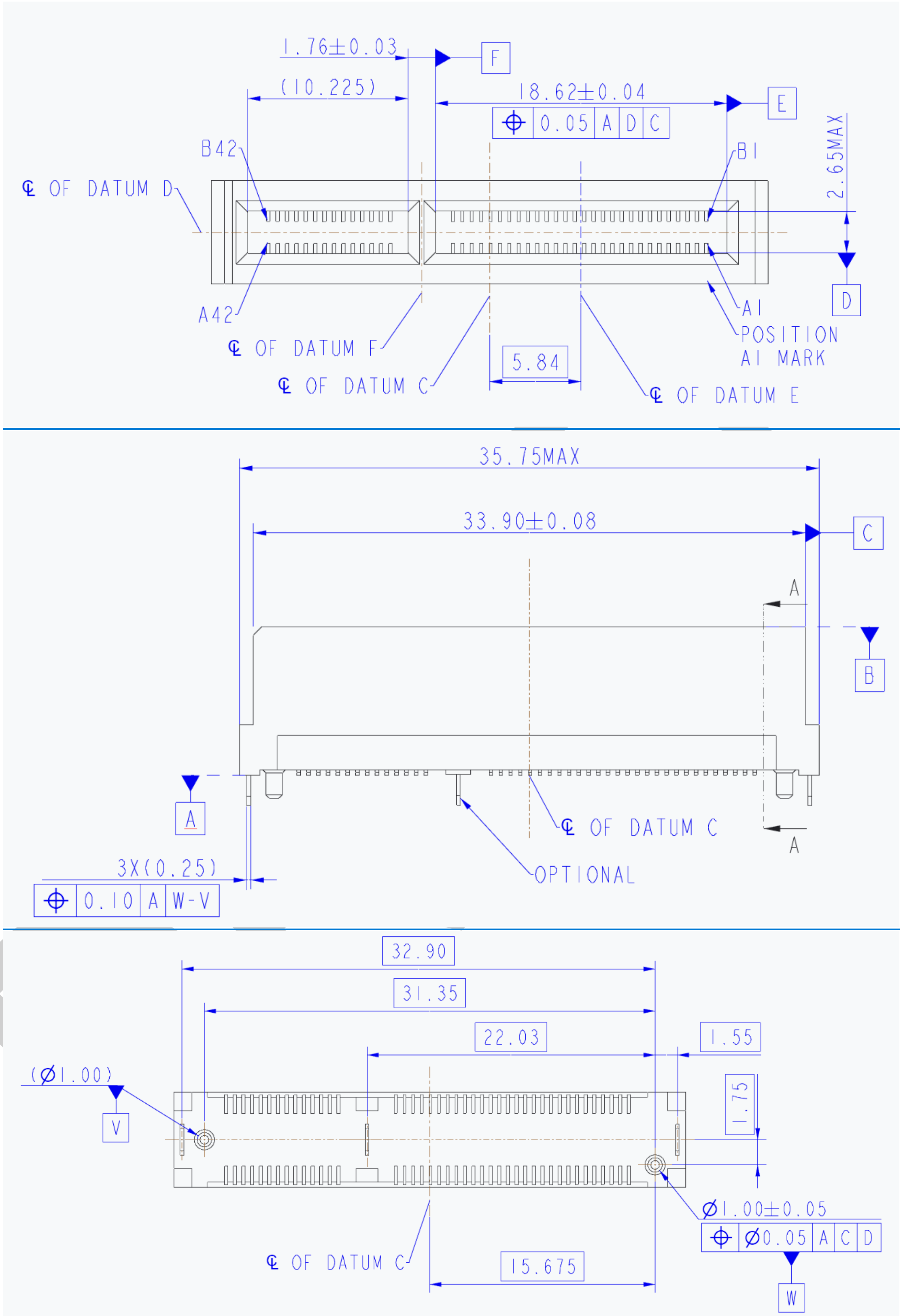


Figure 8-2. 2C-2.36 Straight Connector Dimensions

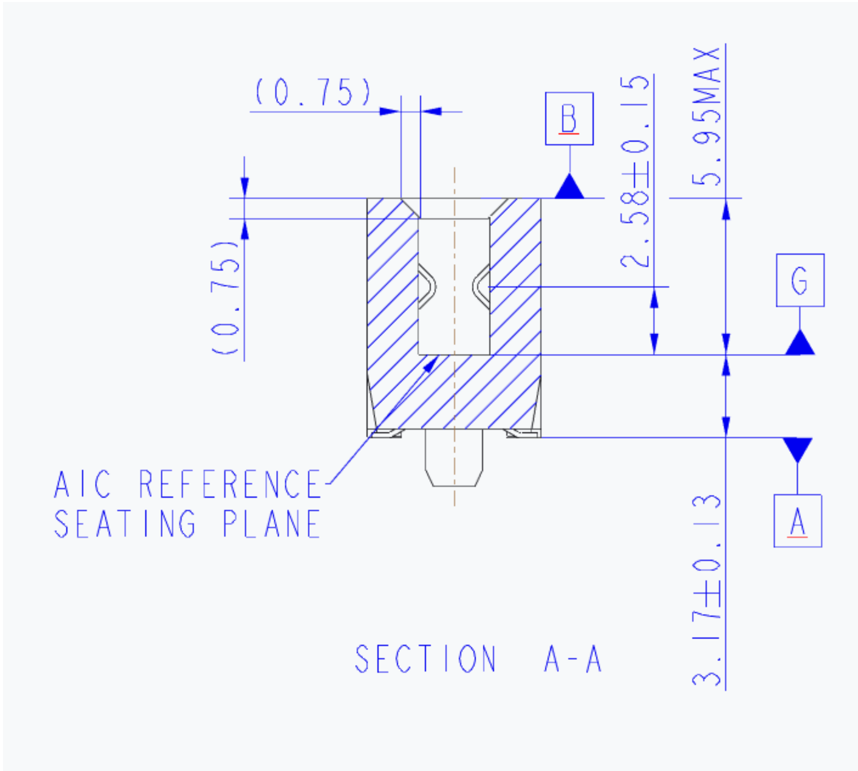


Figure 8-3. Section A: 2C-2.36 Straight Connector Seating Plane

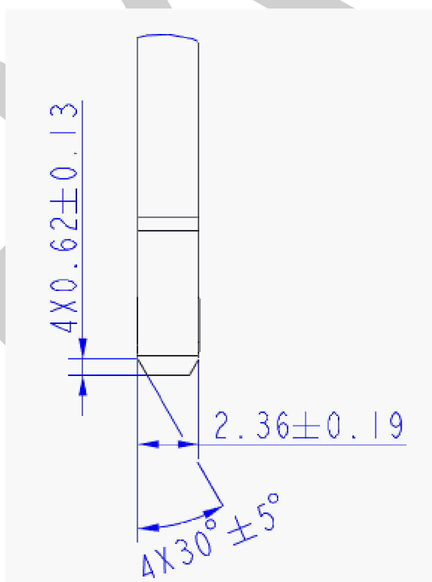
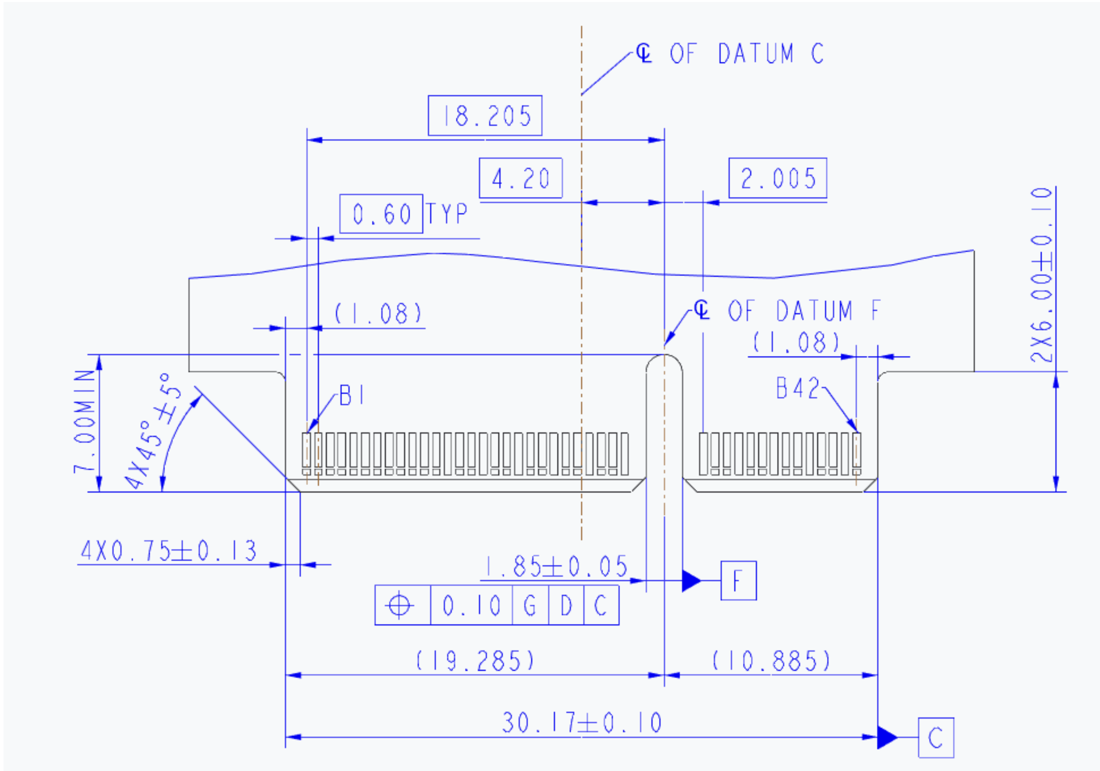


Figure 8-4. 2C-2.36 AIC Mating Card Profile Dimensions



Notes: Position A1 on opposite side of card of B1. Dimensions for pad locations are to center of the pad.

Figure 8-5. AIC 2C-2.36 Mating Card Dimensions

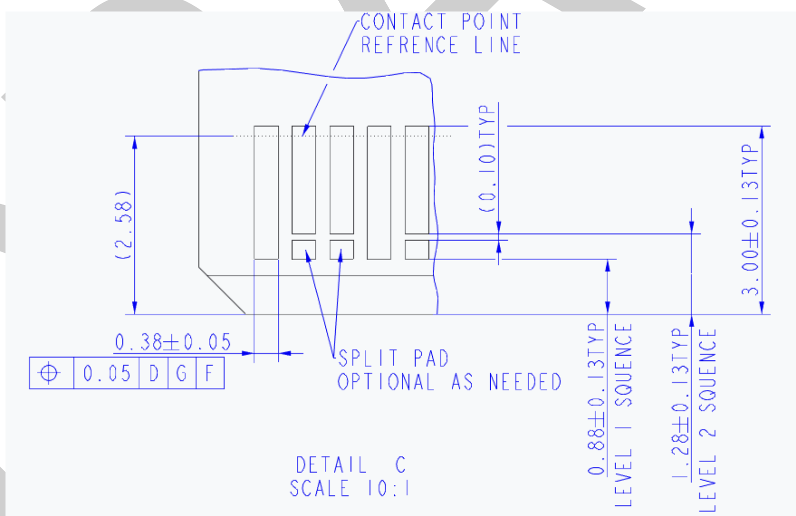


Figure 8-6. Detail C: 2C-2.36 AIC Pad Dimensions (Optional Split Pad Shown)

Appendix PCB Footprints

A.1. Vertical Internal Cable Receptacle Footprints

All material within this section, whether defined as normative or informative, is subject to IP disclosure and RAND terms by SNIA SFF TA TWG member companies. The following figures show informative PCB footprints for internal vertical internal cable receptacle connector. All other dimensions of footprints are per SFF-TA-1002.

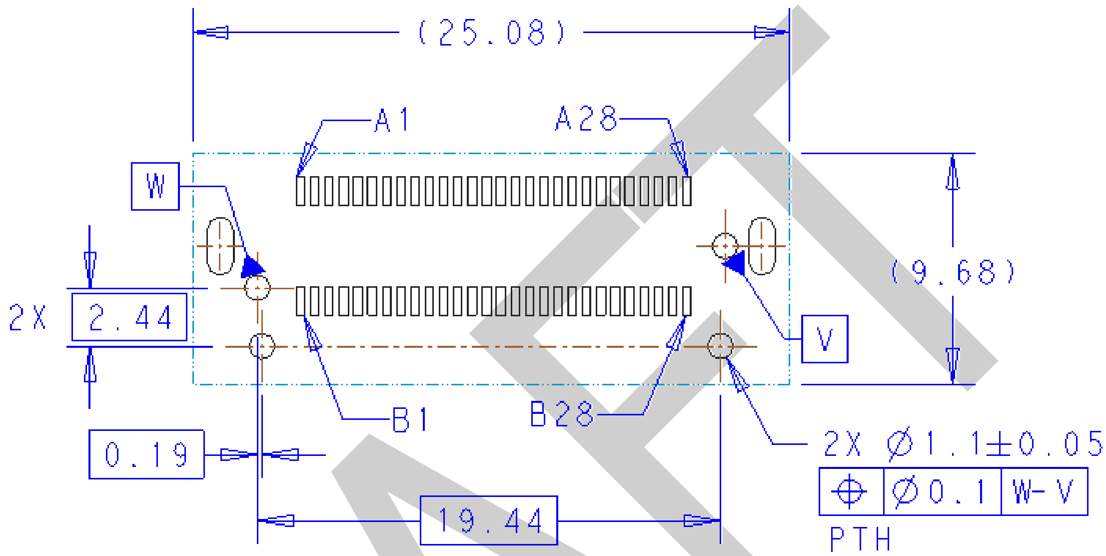


Figure A-1: 1C Vertical Internal Cable Receptacle Footprint

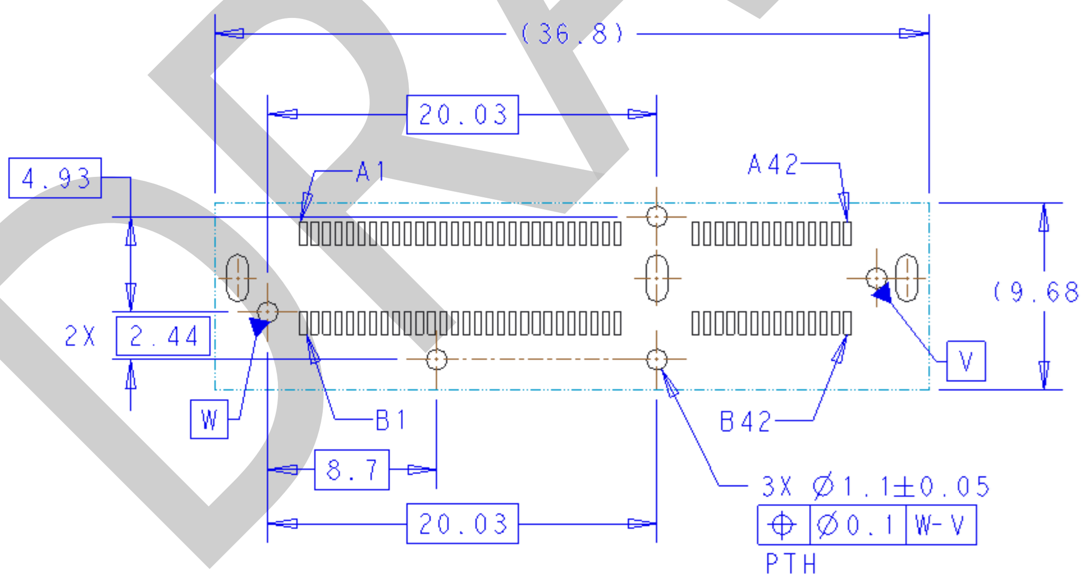


Figure A-2. 2C Vertical Internal Cable Receptacle Footprint

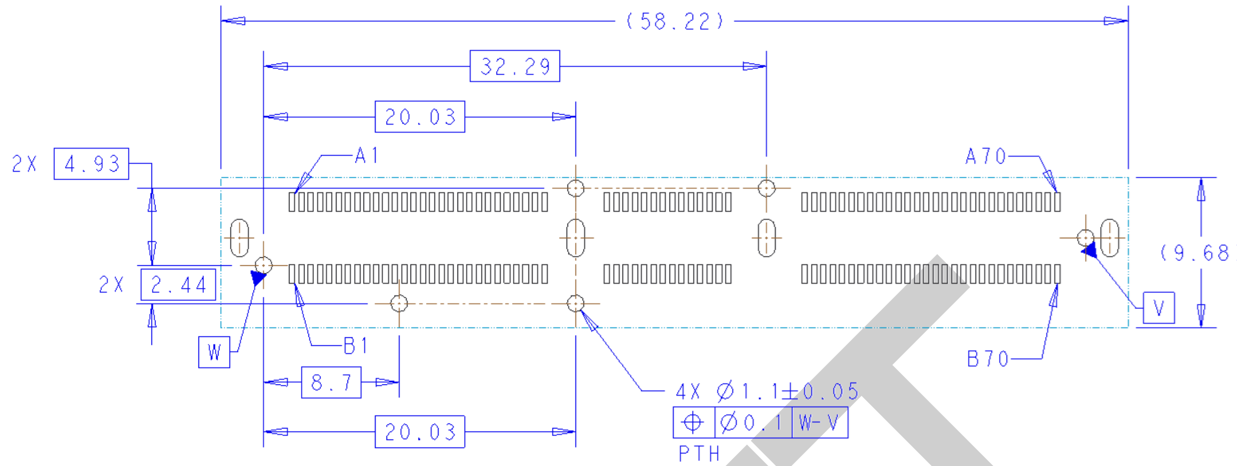


Figure A-3. 4C Vertical Internal Cable Receptacle Footprint

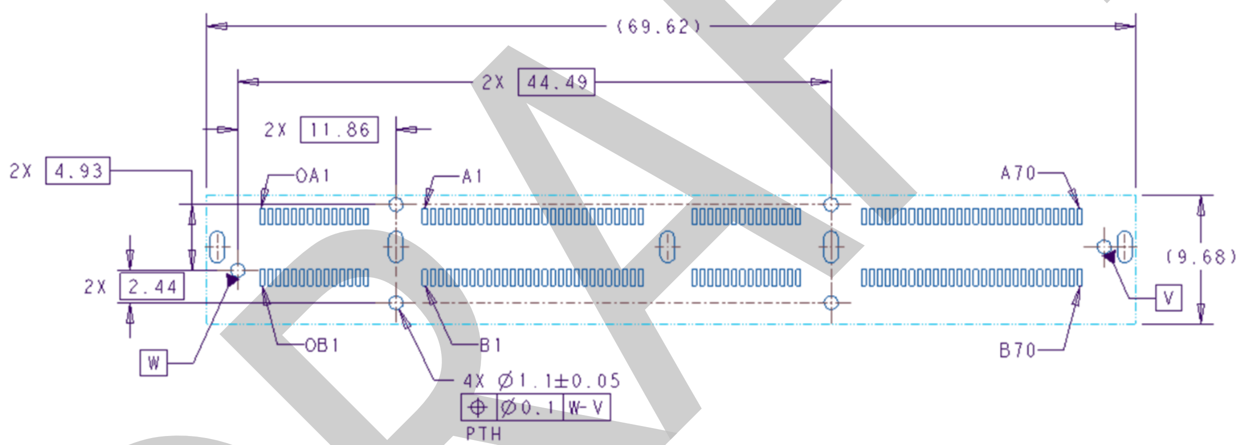


Figure A-4. 4C+ Vertical Internal Cable Receptacle Footprint

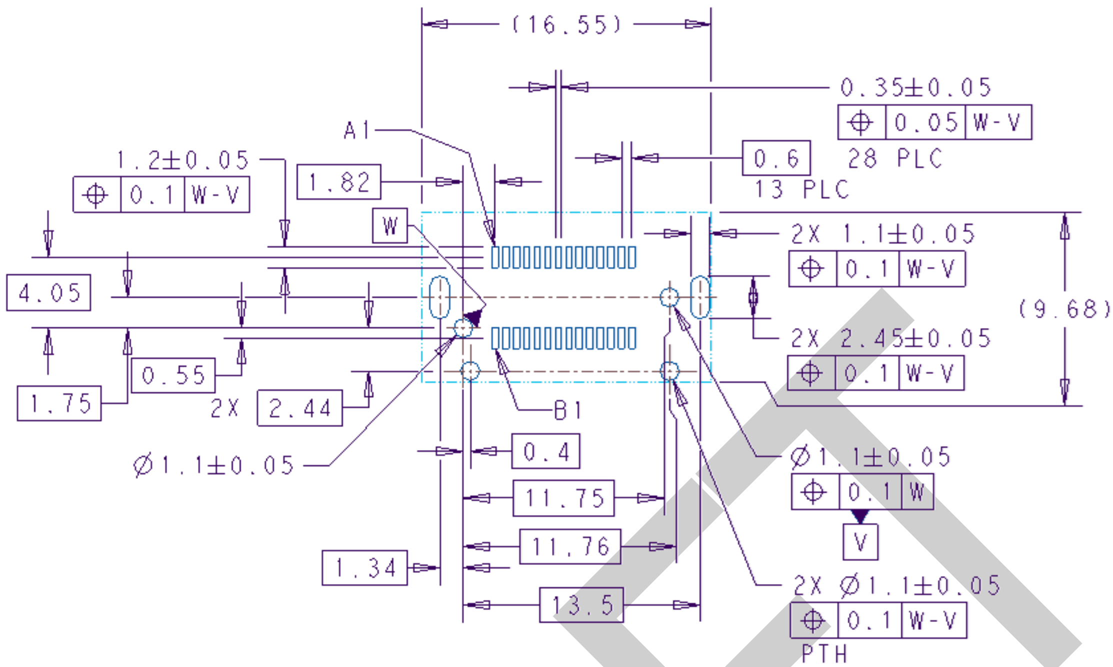


Figure A-5. 28 Pin Vertical Internal Cable Receptacle Footprint

A.2. Right Angle Internal Cable Receptacle Footprints

The following figures show informative PCB footprints for internal right angle cable receptacle connector. All other dimensions of footprints are per SFF-TA-1002.

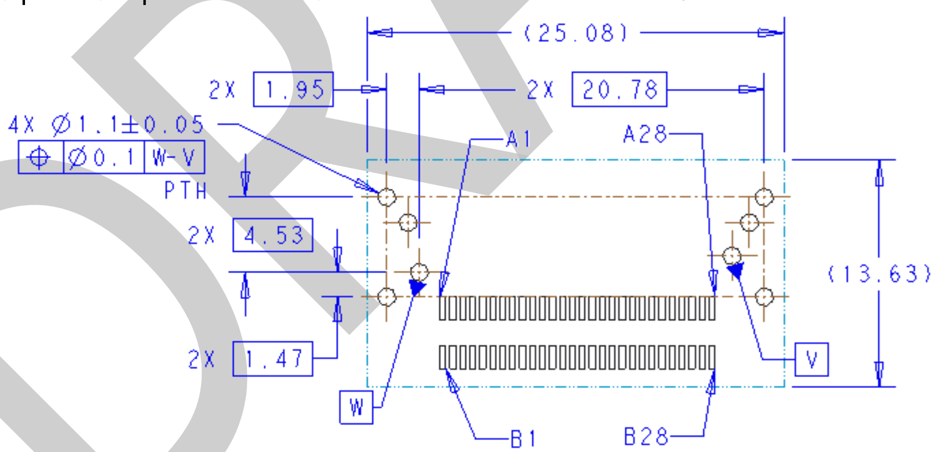


Figure A-444. 1C Right Angle Internal Cable Receptacle Footprint

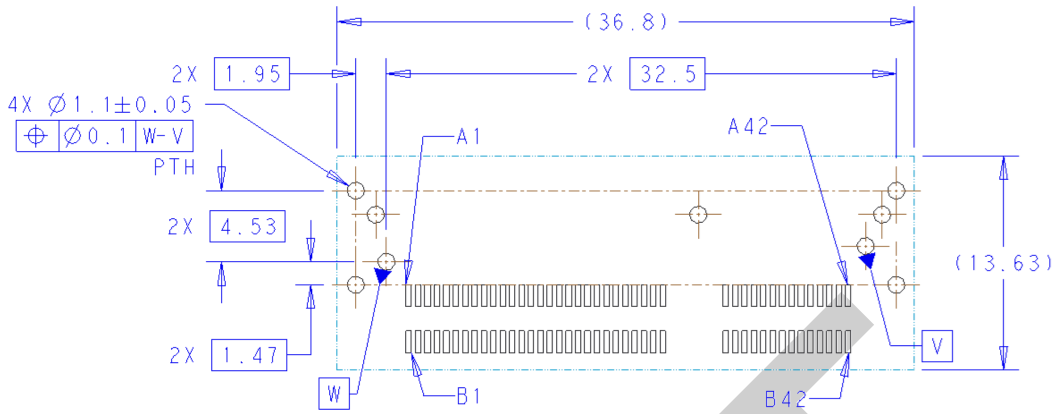


Figure A-555. 2C Right Angle Internal Cable Receptacle Footprint

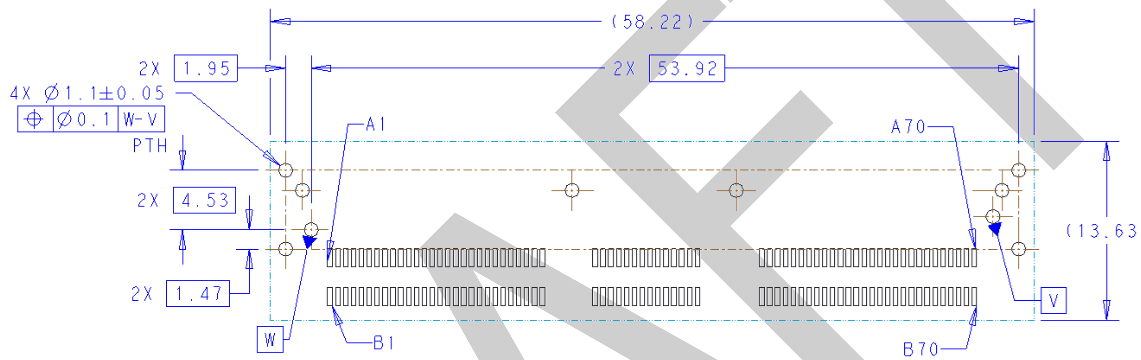


Figure A-666. 4C Right Angle Internal Cable Receptacle Footprint

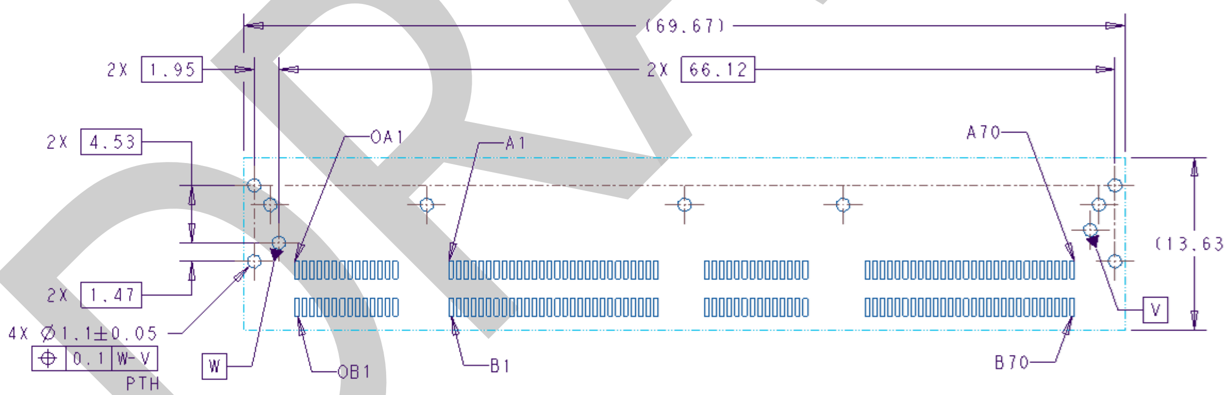


Figure A-9. 4C+ Right Angle Internal Cable Receptacle Footprint

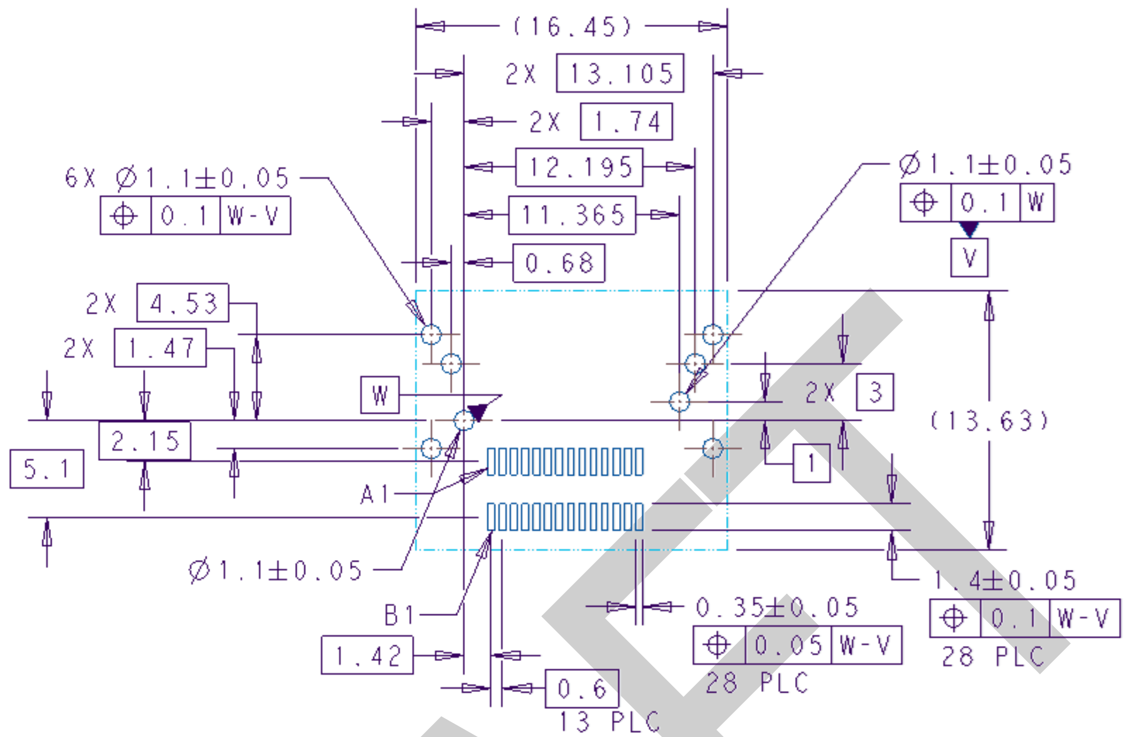


Figure A-10. 28 Pin Right Angle Internal Cable Receptacle Footprint

A.3. 280 Pin Connector PCB Footprint

The following figures show informative PCB footprints for the 4C-HP 12V and 48V connectors. Refer to Table 6-1. Dimensions for High-Power 12V and 48V AICs, Connectors and Footprints~~Table 6-1. Dimensions for High-Power 12V and 48V AICs, Connectors and Footprints~~~~Error! Reference source not found.~~ for tabularized dimensions. All other dimensions of footprints are per SFF-TA-1002.

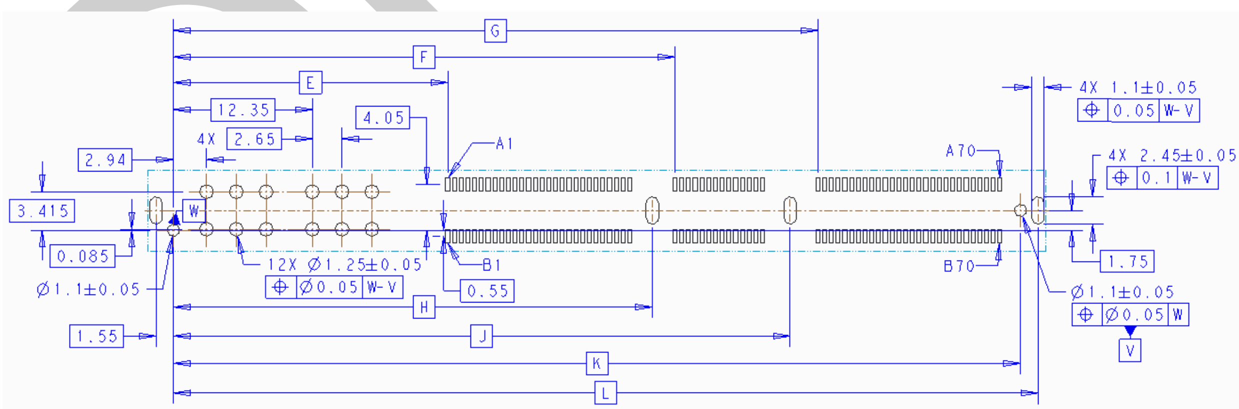


Figure A-7~~7~~. 4C-HP 12V/48V High-Power Connector Reference Footprint Dimensions

A.4. 280 Pin Connector PCB Footprint

The following figures show informative PCB footprints for the 280 Pin connector. All other dimensions of footprints are per SFF-TA-1002.

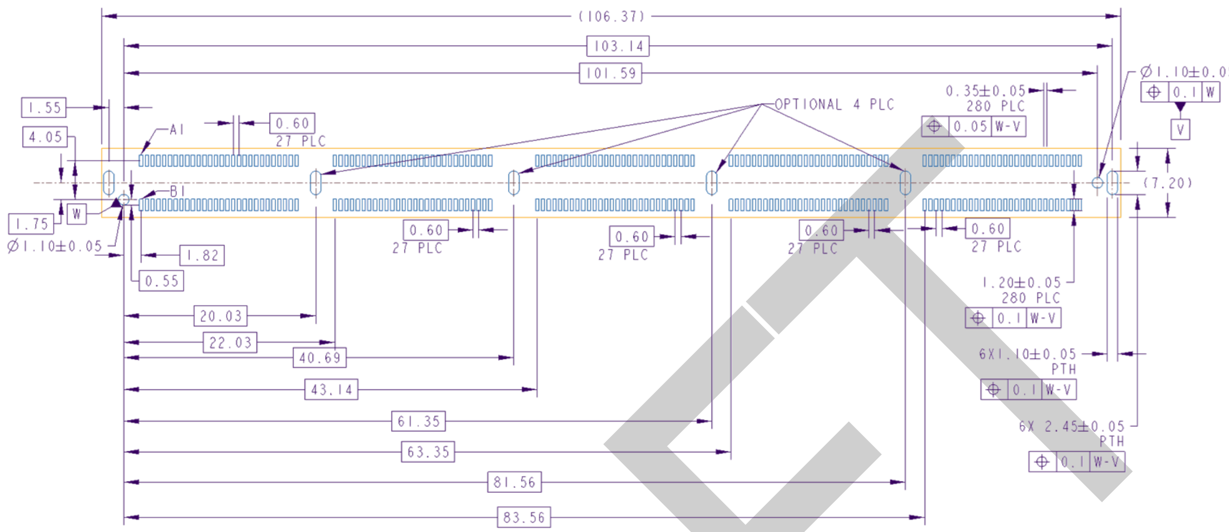


Figure A-888. 280 Pin Connector Reference Footprint Dimension

Media Bay Example

The following describes an example implementation of cables and connectors in a Media Bay application, where a Media Bay is a 3-D mechanical structure with a back panel PCB (BP) that accepts user pluggable media modules with the SFF-TA-1002 connector interface as illustrated in Figure B-1. The BP illustrates a 4C vertical connector that accepts a media module on one side and a 4C vertical internal cable receptacle placed directly opposite on the other side. An internal cable plugs into the 4C internal cable receptacle connector and into internal host resources.

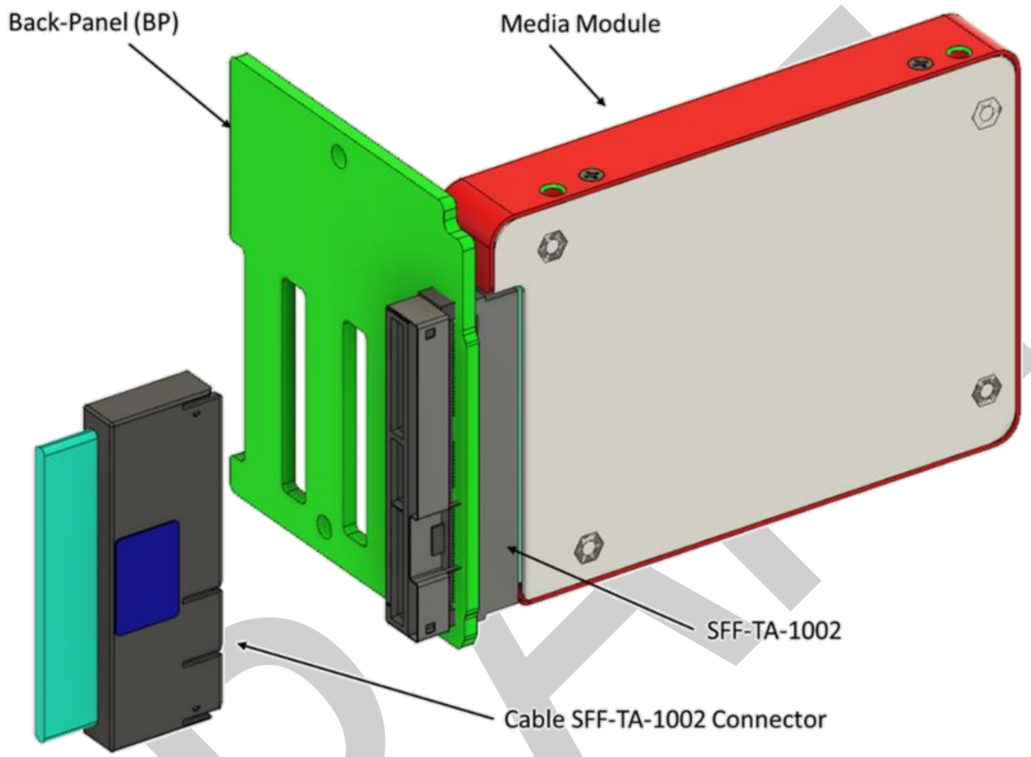


Figure B-1. Media Bay Module Mated with PCB Equipped with *SFF-TA-1002* 4C Connector

The front media *SFF-TA-1002* connector and the back internal cable SFF-TA-1002 connector are mounted precisely opposite on the BP PCB. This configuration provides the following benefits:

- Maximizes through BP airflow for cooling media modules and downstream components.
- Enables tighter module pitch.
- Enables cooling solutions for high-power devices.
- Eliminates signal trace lengths, signal swapping, and cross-over cabling as the pinouts are maintained on both connectors.
- Minimizes VIAs and short traces on the BP to support higher signaling rates.

The signal pinout for the internal media and rear internal cable are as specified in this document.
The BP layout illustrated in maintains commonality of signal assignments on each connector by routing signals through VIAs on the rear of the BP to the front.

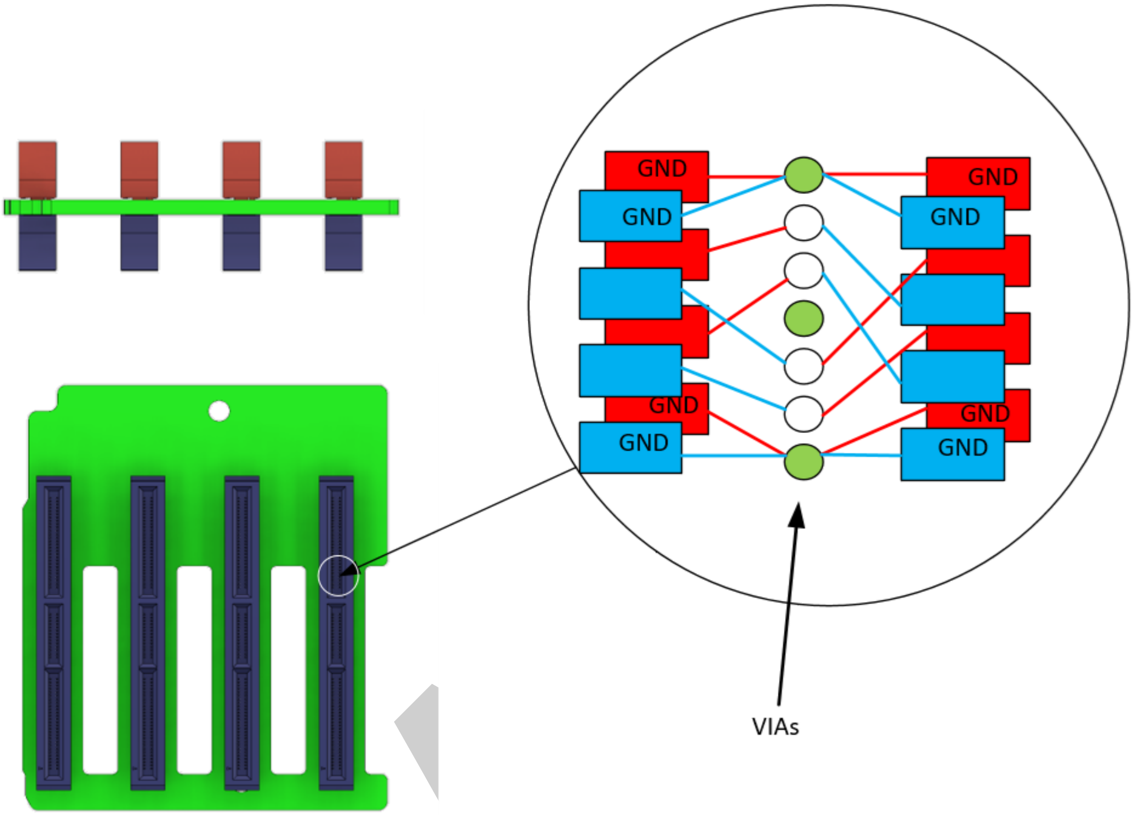


Figure B-2. PCB Routing Method to Maintain Pinouts Orientation

For modules that require the 4C-HP high-power connector and/or 48V, it is recommended that power be distributed through the BP to the power pins on the media connector and not delivered through the internal cable connector. It is recommended that 12V and non-high-speed differential pairs be provided through the BP distribution and/or be populated as needed.

Figure B-3 illustrates a recommended implementation of the 4C connectors to allow for BP belly-to-belly placement.

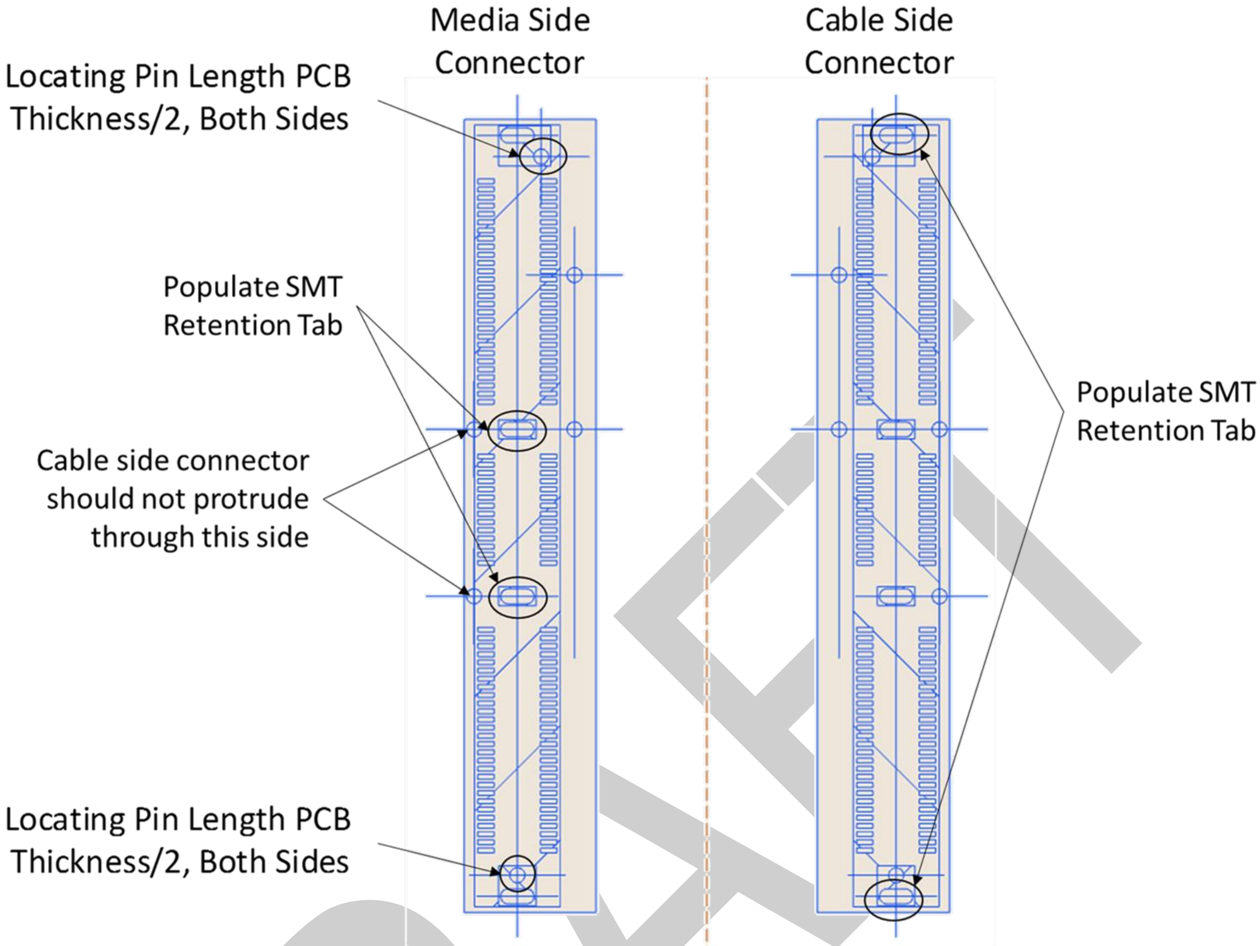


Figure B-3. 4C Vertical Media Bay / Internal Cable Receptacle Modifications