SFF specifications are available at http://www.snia.org/sff/specifications
or ftp://ftp.seagate.com/sff

This specification was developed by the SFF Committee prior to it becoming the SFF TA (Technology Affiliate) TWG (Technical Working Group) of SNIA (Storage Networking Industry Association).

The information below should be used instead of the equivalent herein.

POINTS OF CONTACT:

Chairman SFF TA TWG
Email: SFF-Chair@snia.org

If you are interested in participating in the activities of the SFF TWG, the membership application can be found at:
http://www.snia.org/sff/join

The complete list of SFF Specifications which have been completed or are currently being worked on can be found at:
http://www.snia.org/sff/specifications/SFF-8000.TXT

The operations which complement the SNIA's TWG Policies & Procedures to guide the SFF TWG can be found at:
http://www.snia.org/sff/specifications/SFF-8032.PDF

Suggestions for improvement of this specification will be welcome, they should be submitted to:
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SFF Committee documentation may be purchased (see 2.3).
SFF Specifications available by FTP at fission.dt.wdc.com/pub/standards/sff/spec

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SFF Committee

SFF-8451 Specification for

SCA-2 Unshielded Connections

Rev 10.1 November 10, 1998

Secretariat: SFF Committee

Abstract: This document defines the physical interface and performance requirements for SCA-2 (Single Connector Attach -2) connectors and retention schemes to be used for SCSI and FC-AL unshielded device connections. Other uses of this general-purpose connection system are also possible.

This document provides a common specification for systems manufacturers, system integrators, and suppliers of magnetic disk drives. This is an internal working document of the SFF Committee, an industry ad hoc group.

This document is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this document.

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

Support: This document is supported by the identified member companies of the SFF Committee.

Documentation: This document has been prepared in a similar style to that of the ISO (International Organization of Standards).

POINTS OF CONTACT:

Bill Ham
Compaq Computer
334 South St
Shrewsbury, MA 01545

Ph: 508-841-2629 Fx: 508-841-5266
Email: Bill_Ham@compaq.com

I. Dal Allan
Chairman SFF Committee
14426 Black Walnut Court
Saratoga CA 95070

Ph: 408-867-6630 Fx: 408-867-2115

EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

AMP	Integral Peripherals
Berg	Madison Cable
Compaq	Montrose/CDT
DDK Electronics	Robinson Nugent
DEC	Seagate
ENDL	Thomas & Betts
Harting Elect	Unisys
Hitachi America	Winchester Elect
Hitachi Cable	

The following member companies of the SFF Committee voted against this industry specification.

Molex	Specialty Electronics

The following member companies of the SFF Committee voted to abstain on this industry specification.

3M	Honda Connector
Adaptec	IBM
All Best Techniq	JTS
Amphenol	Maxtor
Circuit Assembly	O R Technology
Cirrus Logic	Quantum
Dell	Toshiba America
Framatome	Western Digital

The following member companies of the SFF Committee voted to forward this industry specification.

AMP	Integral Peripherals
Compaq	Seagate
Honda Connector	

The user's attention is called to the possibility that implementation to this Specification may require use of an invention covered by patent rights. By distribution of this Specification, no position is taken with respect to the validity of this claim or of any patent rights in connection therewith. The patent holder has filed a statement of willingness to grant a license under these rights on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain such a license.

If you are not a member of the SFF Committee, but you are interested in participating, the following principles have been reprinted here for your information.

PRINCIPLES OF THE SFF COMMITTEE

The SFF Committee is an ad hoc group formed to address storage industry needs in a prompt manner. When formed in 1990, the original goals were limited to defining de facto mechanical envelopes within which disk drives can be developed to fit compact computer and other small products.

Adopting a common industry size simplifies the integration of small drives (2 1/2" or less) into such systems. Board-board connectors carrying power and signals, and their position relative to the envelope are critical parameters in a product that has no cables to provide packaging leeway for the integrator.

In November 1992, the SFF Committee objectives were broadened to encompass other areas which needed similar attention, such as pinouts for interface applications, and form factor issues on larger disk drives. SFF is a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

Documents created by the SFF Committee are expected to be submitted to bodies such as EIA (Electronic Industries Association) or an ASC (Accredited Standards Committee). They may be accepted for separate standards, or incorporated into other standards activities.

The principles of operation for the SFF Committee are not unlike those of an accredited standards committee. There are 3 levels of participation:

- Attending the meetings is open to all, but taking part in discussions is limited to member companies, or those invited by member companies
- The minutes and copies of material which are discussed during meetings are distributed only to those who sign up to receive documentation.
- The individuals who represent member companies of the SFF Committee receive documentation and vote on issues that arise. Votes are not taken during meetings, only guidance on directions. All voting is by letter ballot, which ensures all members an equal opportunity to be heard.

Material presented at SFF Committee meetings becomes public domain. There are no restrictions on the open mailing of material presented at committee meetings. In order to reduce disagreements and misunderstandings, copies must be provided for all agenda items that are discussed. Copies of the material presented, or revisions if completed in time, are included in the documentation mailings.

The sites for SFF Committee meetings rotate based on which member companies volunteer to host the meetings. Meetings have typically been held during the ASC T10 weeks.

The funds received from the annual membership fees are placed in escrow, and are used to reimburse ENDL for the services to manage the SFF Committee.

Foreword

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, connector location, between vendors.

The first use of these disk drives was in specific applications such as laptop portable computers in which space was at a premium and time to market with the latest machine was an important factor. System integrators worked individually with vendors to develop the packaging. The result was wide diversity, and with space being such a major consideration in packaging, it was not possible to replace one vendor's drive with a competitive product.

The desire to reduce disk drive sizes to even smaller dimensions such as 1.8" and 1.3" made it likely that devices would become even more constrained in dimensions because of a possibility that such small devices could be inserted into a socket, not unlike the method of retaining semiconductor devices.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology in disk drives. After two informal gatherings on the subject in the summer of 1990, the SFF Committee held its first meeting in August.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced problems other than the physical form factors of disk drives. In November 1992, the members approved an expansion in charter to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

At the same time, the principle was adopted of restricting the scope of an SFF project to a narrow area, so that the majority of documents would be small and the projects could be completed in a rapid timeframe. If proposals are made by a number of contributors, the participating members select the best concepts and uses them to develop specifications which address specific issues in emerging storage markets.

Those companies which have agreed to support a documented specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF Specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

Suggestions for improvement of this document will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in 1990 through July 1998 has included the following organizations:

3M	Methode Electronics
Adaptec	Microsoft
All Best Technique	MiniStor Peripherals
Alps Tohoku	Mitsumi
AMP	Molex
Amphenol Interconnect	Montrose/CDT

Apple Computer
Areal Technology
Aztech Systems
Berg Electronics
Burndy
Circuit Assembly
Cirrus Logic
Compaq Computer
Conner Peripherals
Dell Computer
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Harting Electronik
Harting North America
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Hitachi America
Hitachi Cable Manchester
Honda Connectors
IBM
Integral Peripherals
Intel
Intellistor
Iomega
JPM
JTS
JVC
LG Electronics
Madison Cable
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Maxtor
National Semiconductor
NEC Deutschland
NYPLA Industrial
O R Technology
Oak Technology
Philips Laser Optics Systems
PrairieTek
Promise Technology
Quantum
Ricoh
Robinson Nugent
Rodime
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Silicon Systems
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Wearnes Hollingsworth
Wearnes Peripherals
Wearnes Technology
Western Digital
Winchester Electronics
YC Cable USA
Zenith Data Systems

If you are not receiving the documentation of SFF Committee activities or are interested in becoming a member, the following signup information is reprinted here for your information.

Annual SFF Committee Membership Fee	$ 1,800.00
Annual SFF Committee Paper Documentation Fee	$ 300.00
Annual Surcharge for AIR MAIL to Overseas	$ 100.00
Annual Surcharge for Electronic Documentation	$ 360.00

Name: _____

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Please register me as a Member of the SFF Committee for one year.

Paper documentation	$ 1,800
Electronic documentation	$ 2,160

Check Payable to SFF Committee for $_____ is Enclosed

Please invoice me $_____ on PO #: _____

MC/Visa/AmX_____ Expires_____

Please register me as an Observer on the SFF Committee for one year.

Paper documentation	$ 300 U.S. $ 400 Overseas
Electronic documentation	$ 660 U.S. $ 760 Overseas

Check Payable to SFF Committee for $_____ (POs Not Accepted)

MC/Visa/AmX_____ Expires_____

SFF Committee 408-867-6630
14426 Black Walnut Ct 408-867-2115Fx
Saratoga CA 95070 250-1752@mcimail.com

SFF Committee --

SCA-2 Unshielded Connections

1. Scope

This specification defines the terminology and physical requirements for unshielded SCA-2 (Single Connector Attach -2) connections and complete connectors. There are two overall versions specified: 80-pin SCSI and 40-pin FC-AL. These two versions are identical except for the dimensional changes caused by the difference in pin count and the position of the long and short pins.

Such connections are desirable in SCSI and FC-AL systems where devices need to blindmate with backplanes and to support the SCSI-3 requirements for hot plugging. The SPI-2 (SCSI-3 Parallel Interface 2) standard calls out EIA-PN-3651 and defines the position numbering for SCSI for the 80-pin version as an unshielded device and cable connector.

The hot plugging requirements break down into three key features for a connector system:

(1) the connector must consist of a single housing on both sides of the mating interface to manage the positional mounting tolerances,
(2) there must be a means to mechanically "guide" (without aid of visual feedback) the mating interfaces into a position where the electrical contact can mate without damage, and
(3) the contact pins must have a specific sequence of mating and demating.

This latter requirement is both good engineering practice and a specific requirement of the SCSI-3 SPI (SCSI-3 Parallel Interface) standard.

SCA-2 connectors are compatible with SCA-1 connectors in the sense they will physically intermate. SCA-1 connectors do not have the latter two features listed above and are therefore not suitable for blind mating and hot plugging.

Other unitized connector versions exist for SCSI where the conventional SCSI device connectors (low density 50-position or high density 68-position) are simply molded into a single housing with the 4-pin power connector. The 68-pin version also has a 2 x 6 position options section. The contact styles are different for each of the three functions. While this scheme can work technically it has not been widely accepted by the industry and requires significantly more space on the device and backplane for the connector than the SCA-2.

Both the single housing conventional and the SCA offer the cost reductions associated with fewer parts needed for a storage device. SCA connectors offer both cost benefits and cost liabilities. When used as a means to directly plug a device into a backplane SCA allows cost reduction by eliminating the intermediate cable assembly between the device and the backplane. Such cable assemblies are needed with conventional device connectors (in many cases) because the three functions; power, options, and data; all use different connectors.

The possibility of a cost liability is seen in systems which do not use backplanes (such as workstations and PC's). In these systems, one must provide an adapter cable assembly that mates with the SCA-2 on one side and has appropriate cable-compatible connectors on the other side. Therefore, for non-backplane systems the SCA-2 connector creates the need for an additional cable assembly while in backplane

systems the SCA-2 allows for the elimination of a cable assembly.

This tradeoff has positioned the SCA-2 as preferable for large capacity storage devices that are primarily utilized in backplane applications.

The mating side for the SCA-2 connector family is the same for all versions of the same gender and pin count. The termination side of the connectors are different to accommodate the requirements of popular assembly techniques such as cable backshell and and printed circuit board mounting. The termination side must be associated with the gender of its mating side as different mating side genders have different pin numbering (mirror images).

This document specifies the requirements on the mating and termination sides of the connectors to enable functional multiple sourcing of the complete connectors. The construction of the connectors between the mating and the termination sides are not controlled by this document. In the present selection of complete connectors specified there is no shielding provided, no provision for connecting shields together, and no provision for terminating shields. Therefore there are no specifications for any backshell-to-connector interfaces.

Fibre Channel standards presently incorporate requirements on the characteristic impedance and ability to transmit Gigabit signals for cable assemblies and backplanes. Since the SCA-2 connector system may form part of this interconnect it is also subject to these requirements.

In an effort to broaden the applications for storage devices, an ad hoc industry group of companies representing system integrators, peripheral suppliers, and component suppliers decided to address the issues involved.

The SFF Committee was formed in August, 1990 and the first working document was introduced in January, 1991.

1.1 Description of Clauses

Clause 1 contains the Scope and Purpose.

Clause 2 contains Referenced and Related Standards and SFF Specifications.

Clause 3 contains the General Description.

Clause 4 contains the Glossary.

Clause 5 defines the connectors.

Clause 6 defines physical dimensions.

2. References

The SFF Committee activities support the requirements of the storage industry, and it is involved with several standards.

2.1 Industry Documents

The following interface standards are relevant to many SFF Specifications.

- X3.131R-1994 SCSI-2 Small Computer System Interface
- X3.253-1995 SPI (SCSI-3 Parallel Interface)

- X3.302-xxxx SPI-2 (SCSI-3 Parallel Interface -2)
- X3.277-1996 SCSI-3 Fast 20
- X3.221-1995 ATA (AT Attachment) and subsequent extensions
- EIA PN-3651 Detail Specification for Trapezoidal Connector 0.50" Pitch used with Single Connector Attach -2.
- X3.230-1994 FC-PH (Fibre Channel Physical Interface) and subsequent extensions
- ANSI-Y14.5M Dimension and Tolerancing

2.2 SFF Specifications

There are several projects active within the SFF Committee. At the date of printing document numbers had been assigned to the following projects. The status of Specifications is dependent on committee activities.

F = Forwarded	The document has been approved by the members for forwarding to a formal standards body.
P = Published	The document has been balloted by members and is available as a published SFF Specification.
A = Approved	The document has been approved by ballot of the members and is in preparation as an SFF Specification.
C = Canceled	The project was canceled, and no Specification was Published.
D = Development	The document is under development at SFF.
E = Expired	The document has been published as an SFF Specification, and the members voted against re-publishing it when it came up for annual review.
e = electronic	Used as a suffix to indicate an SFF Specification which has Expired but is still available in electronic form from SFF e.g. a specification has been incorporated into a draft or published standard which is only available in hard copy.
i = Information	The document has no SFF project activity in progress, but it defines features in developing industry standards. The document was provided by a company, editor of an accredited standard in development, or an individual. It is provided for broad review (comments to the author are encouraged).
s = submitted	The document is a proposal to the members for consideration to become an SFF Specification.

Spec #	Rev	List of Specifications as of November 21, 1998
SFF-8000		SFF Committee Information
SFF-8001i	E	44-pin ATA (AT Attachment) Pinouts for SFF Drives
SFF-8002i	E	68-pin ATA (AT Attachment) for SFF Drives
SFF-8003	E	SCSI Pinouts for SFF Drives
SFF-8004	E	Small Form Factor 2.5" Drives
SFF-8005	E	Small Form Factor 1.8" Drives
SFF-8006	E	Small Form Factor 1.3" Drives
SFF-8007	E	2mm Connector Alternatives
SFF-8008	E	68-pin Embedded Interface for SFF Drives
SFF-8009	4.0	Unitized Connector for Cabled Drives
SFF-8010	E	Small Form Factor 15mm 1.8" Drives
SFF-8011i	E	ATA Timing Extensions for Local Bus
SFF-8012	2.1	4-Pin Power Connector Dimensions
SFF-8013	E	ATA Download Microcode Command
SFF-8014	C	Unitized Connector for Rack Mounted Drives
SFF-8015	E	SCA Connector for Rack Mounted SFF SCSI Drives

SFF-8016	C	Small Form Factor 10mm 2.5" Drives
SFF-8017	E	SCSI Wiring Rules for Mixed Cable Plants
SFF-8018	E	ATA Low Power Modes
SFF-8019	E	Identify Drive Data for ATA Disks up to 8 GB
SFF-8020i	2.6	ATA Packet Interface for CD-ROMs
SFF-8028i	E	- Errata to SFF-8020 Rev 2.5
SFF-8029	E	- Errata to SFF-8020 Rev 1.2
SFF-8030	1.7	SFF Committee Charter
SFF-8031		Named Representatives of SFF Committee Members
SFF-8032	1.2	SFF Committee Principles of Operation
SFF-8033i	E	Improved ATA Timing Extensions to 16.6 MBs
SFF-8034i	E	High Speed Local Bus ATA Line Termination Issues
SFF-8035i	E	Self-Monitoring, Analysis and Reporting Technology
SFF-8036i	E	ATA Signal Integrity Issues
INF-8037i	1.0	Intel Small PCI SIG
INF-8038i	1.0	Intel Bus Master IDE ATA Specification
SFF-8039i	E	Phoenix EDD (Enhanced Disk Drive) Specification
SFF-8040	1.2	25-pin Asynchronous SCSI Pinout
SFF-8041	C	SCA-2 Connector Backend Configurations
SFF-8042	C	VHDCI Connector Backend Configurations
SFF-8043	1.0	40-pin MicroSCSI Pinout
SFF-8045	3.7	40-pin SCA-2 Connector w/Parallel Selection
SFF-8046	E	80-pin SCA-2 Connector for SCSI Disk Drives
SFF-8047	C	40-pin SCA-2 Connector w/Serial Selection
SFF-8048	C	80-pin SCA-2 Connector w/Parallel ESI
SFF-8049	2.7	80-conductor ATA Cable Assembly
INF-8050i	1.0	Bootable CD-ROM
INF-8051i	E	Small Form Factor 3" Drives
INF-8052i	E	ATA Interface for 3" Removable Devices
INF-8053i	4.3	GBIC (Gigabit Interface Converter)
INF-8055i	2.0	SMART Application Guide for ATA Interface
SFF-8056	2.0	50-pin 2mm Connector
SFF-8057	1.2	Unitized ATA 2-plus Connector
SFF-8058	1.2	Unitized ATA 3-in-1 Connector
SFF-8059	2.5	40-pin ATA Connector
SFF-8060	1.1	SFF Committee Patent Policy
SFF-8061	1.1	Emailing drawings over the SFF Reflector
SFF-8065	C	40-pin SCA-2 Connector w/High Voltage
SFF-8066	C	80-pin SCA-2 Connector w/High Voltage
SFF-8067	1.8	40-pin SCA-2 Connector w/Bidirectional ESI
SFF-8068	1.0	Guidelines to Import Drawings into SFF Specs
SFF-8069	1.0	Fax-Access Instructions
INF-8070i	1.1	ATAPI for Rewritable Removable Media
SFF-8080	E	ATAPI for CD-Recordable Media
SFF-8090	E	ATAPI for DVD (Digital Video Data)
SFF-8200e	1.1	2 1/2" drive form factors (all of 82xx family)
SFF-8201e	1.3	2 1/2" drive form factor dimensions
SFF-8212e	1.2	2 1/2" drive w/SFF-8001 44-pin ATA Connector

SFF-8300e	1.1	3 1/2" drive form factors (all of 83xx family)
SFF-8301e	1.2	3 1/2" drive form factor dimensions
SFF-8302e	1.1	3 1/2" Cabled Connector locations
SFF-8332e	1.2	3 1/2" drive w/80-pin SFF-8015 SCA Connector
SFF-8337e	1.2	3 1/2" drive w/SCA-2 Connector
SFF-8342e	1.3	3 1/2" drive w/Serial Unitized Connector
SFF-8400	C	Very High Density Cable Interconnect
SFF-8410	0.0	High Speed Serial Testing
SFF-8420	7.1	HSSDC-1 Shielded Connections
SFF-8430	2.1	MT-RJ Duplex Optical Connections
SFF-8441	13.1	VHDCI Shielded Configurations
SFF-8451	10.1	SCA-2 Unshielded Connections
SFF-8480	0.0	HSS (High Speed Serial) DB9
SFF-8500e	1.1	5 1/4" drive form factors (all of 85xx family)
SFF-8501e	1.1	5 1/4" drive form factor dimensions
SFF-8508e	1.1	5 1/4" ATAPI CD-ROM w/audio connectors
SFF-8551	2.0	5 1/4" CD-ROM 1" High form factor
SFF-8610	C	SDX (Storage Device Architecture)

2.3 Sources

Copies of ANSI standards or proposed ANSI standards may be purchased from Global Engineering.

15 Inverness Way East	800-854-7179 or 303-792-2181
Englewood	303-792-2192Fx
CO 80112-5704	

Copies of SFF Specifications are available by FaxAccess or by joining the SFF Committee as an Observer or Member.

14426 Black Walnut Ct	408-867-6630x303
Saratoga	408-867-2115Fx
CA 95070	FaxAccess: 408-741-1600

FaxAccess is a computer-operated service capable of faxing copies of documents selected from a menu. Anyone ordering documents over FaxAccess must be using the handset of a fax machine, as the documents are transmitted over the same line as the caller dialed in on to make the selection(s).

The increasing size of SFF Specifications has made FaxAccess impractical to obtain large documents. Document subscribers and members are automatically updated every two months with the latest specifications. Specifications are available by FTP at fission.dt.wdc.com/pub/standards/sff/spec

Electronic copies of documents are also made available via CD_Access, a service which provides copies of all the specifications plus SFF reflector traffic. CDs are mailed every 2 months as part of the document service, and provide the letter ballot and paper copies of what was distributed at the meeting as well as the meeting minutes.

Editor's Notes

This version contains all the editorial changes recommended by the November 04, 1998 working group and the following technical changes: (1) an additional figure (figure 35) relating to the tolerances on the fully mated position for the right angle versions, (2) tolerances (0.20) added to the B, C, and D versions in figure 49, and (3) changed 8.85 to 9.85 in Figure 49 to achieve agreement between Figure 5 and Figure 7 in the difference between extended and standard heights.

All known technical issues have been resolved and included in this revision.

There are two versions that are descriptive duplicates but have different designs on the termination side. This is an intentional inclusion per SFF plenary action.

This document is ready for a technical content vote and may also be considered for a publication vote.

Note that extensive non-linear conversions have been executed on the original electronic files used for the figures and that any dimensions extracted from features of the figures that are not specifically dimensioned or toleranced are not representative of actual dimensions in any products.

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3. General Description

The presently standardized connection systems available for use with SCSI (Small Computer System Interface) devices require that the system integrator or designer choose between alternatives that are incompatible and somewhat larger physically than the SCA-2. The new SCA-2 connection system is based on 1.27 x 1.60 mm contacts instead of 1.27 x 2.54 mm or 2.54 x 2.54 mm contacts found respectively in the high density and low density unshielded device connectors specified for SCSI prior to SPI-2. This allows more room on the device for other functions. Additional room is provided by reducing the size of the power contacts and by integrating all three functions; power, options, and signals; into a uniform contact style with no intervening housing structures. The SCA-2 maintains adequate electrical performance for all forms of parallel SCSI (including the newest emerging low voltage differential version) and for the copper versions of FC-AL.

This connector family is based on proven connector technology using the mechanically robust ribbon or leaf contact style. It is very difficult to damage the contacts (in contrast to the present high density SCSI family where fragile pins are used on the free side) (see glossary below for definition).

SCA-2 connectors also find their most important application where device removability is important. The advanced grounding contacts not only provide for establishing a reference potential and for electrostatic discharge but also provide a low resistance path for power supply return current during the mating process. This ensures that any power pin will provide its return current to the system ground and will not find sneak paths through diodes or other lower voltage power pins. If there were no advanced grounding contact system there would be only two nominal lengths of pin provided in the SCA-2. This was required to maintain physical compatibility with the SCA-1 family. This means that power and ground contacts would be on the same length pin and it would not be possible to predict whether a power or ground contact would actually be the first to make upon insertion (or last to break upon removal).

The two lengths of signal/power/ground pins are designed to ensure that the longer pins will all make before any shorter pins make upon insertion. The converse is true upon removal. The advanced grounding contacts are also designed to ensure that no signal or power pin makes before the advanced grounding contacts.

Within the group of contacts with the same nominal length there is a distribution of actual lengths. This causes uncertainty for the sequencing relationship between different contacts of the same nominal length. Between the different groups of contact lengths there is a sufficiently wide separation of lengths to guarantee that no contact from one group will overlap into the next group.

Figure 1 shows this important feature in graphical form. The distance shown is the distance between the peaks of the contacts on the long and short contacts. The coplanar surface between the free contact and the free contact housing provides for precise vertical positioning of the fixed contact prior to mating. This scheme eliminates a major source of variation in the contact sequencing distances due to variations in vertical position of the fixed contact prior to mating.

There are two positions identified in the 80 pin version as Mated 1 and Mated 2. These are short pins that are intended to indicate that the connector is fully mated when current can flow between both positions. Unfortunately, because there is a distribution of actual short pin distances within the short pin population, the Mated 1 and Mated 2 pins both passing current is a necessary but not sufficient condition for determining that mating has occurred for all short pins. Similarly, upon demating, these pins are not reliable indicators concerning the mating condition for any other short pins.

Some device status reporting systems require advanced warning that a pin is about to become unmated well before any signal pin actually demates. Others require a positive indication of full mating for all positions some minimum time AFTER all signal pins mate. Therefore, even if the Mated 1 and Mated 2 pins happen to be the last to mate or the first to break, there may not be enough notification time for the status reporting system to react.

It is not possible with the present dimensions for the SCA-2 system to provide a “short short” pin in addition to the short and long pins. Status reporting systems that require the positive indications and time windows will need to provide these functions outside the SCA-2 system. A third pin distance cannot exist because of the need to maintain compatibility with SCA-1 and to have adequate wipe for all contacts.

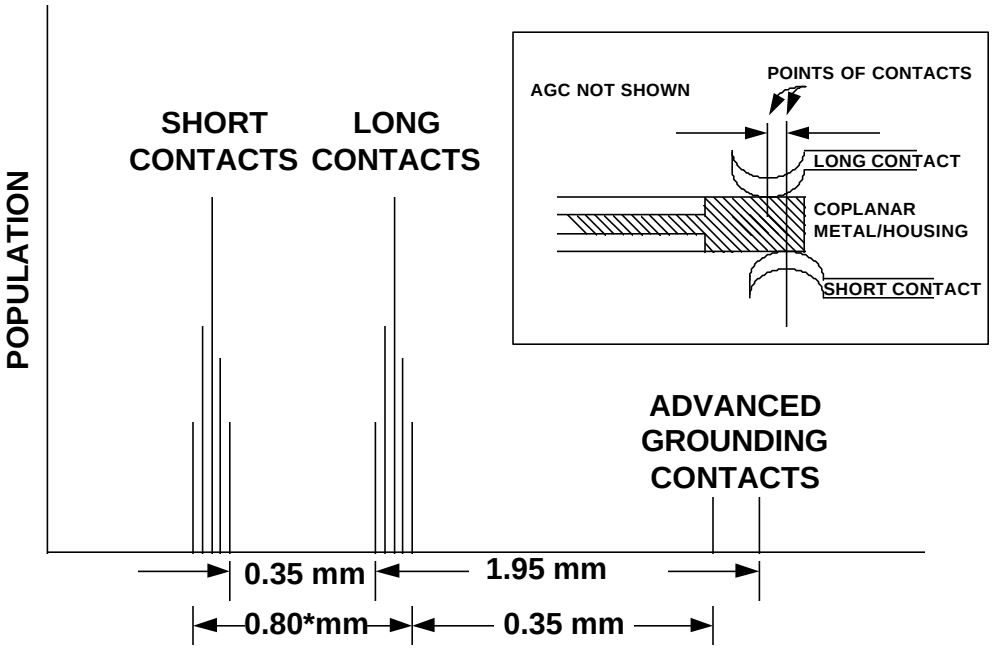


Figure 1 - Contact positioning architecture

Since the 80 pin connector will support both wide and narrow SCSI only an 80 pin version is standardized for SCSI. This allows for a single SCA-2 connector for all forms of SCSI (see SFF-8017).

The use of the SCA-2 technology has no direct effect on the SCSI or FC-AL wiring rules, the SCSI or FC-AL protocol or firmware, or the system configuration rules. When used in a hot plugging application there are operational procedures and design requirements to follow (specified elsewhere) that do not involve the connector (such as stopping traffic prior to device removal and limiting the inrush current on the power precharge contacts). The SCA-2 connector system delivers only the basic mechanical and electrical properties for the hot plugging applications.

4. Definitions and Conventions

4.1 Definitions

For the purpose of SFF Specifications, the following definitions apply:

Advanced grounding contacts: Connector pins that make first and break last and are capable of carrying power ground return currents and performing electrostatic discharge. Other terms sometimes used to describe these features are: grounding pins, ESD contacts, grounding contacts, static drain, and pre-grounding contacts.

Alignment guides: Connector features that are used to direct the connectors during the mating process. Other terms sometimes used to describe these features are: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides

Board Termination Technologies: The lead configuration used for attachment of printed circuit board to the termination side of the connector. Schemes commonly used in the industry are: surface mount single row, surface mount dual row, through hole, hybrid, straddle mount

Cable Termination: The attachment of wires to the termination side of a connector. Schemes commonly used in the industry are IDC (Insulation Displacement Contact), IDT (Insulation Displacement Termination), wire slots, solder, weld, crimp, braise, etc.

Contact mating sequence: Order of electrical contact during mating/unmating process. Other terms sometimes used to describe this feature are: contact sequencing, contact positioning, make first/break last, EMLB (early make late break) staggered contacts, and long pin / short pin.

Fixed: Used to describe the gender of the mating side of the connector that accepts its mate upon mating. This gender is frequently, but not always, associated with the common terminology "receptacle". Other terms commonly used are "female" and "socket connector". The term "fixed" is adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this document "fixed" is specifically used to describe the mating side gender illustrated in Figure 2.

Free: Used to describe the gender of the mating side of the connector that penetrates its mate upon mating. This gender is frequently, but not always, associated with the common terminology "plug". Other terms commonly used are "male" and "pin connector". The term "free" is adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this document "free" is specifically used to describe the mating side gender illustrated in Figure 2.

Frontshell: That metallic part of a connector body that directly contacts the backshell or other shielding material that provides mechanical and shielding continuity between the connector and the cable media. Other terms sometimes used to describe this part of a cable assembly are: housing, nosepiece, cowling, and metal shroud.

Free Board: A connector that uses a free gender mating side and a termination side suitable for any of the printed circuit board termination technologies

Fixed Board: : A connector that uses a fixed gender mating side and a termination side suitable for any of the printed circuit board termination technologies

Mating side: The side of the connector that joins and separates from the mating side of a connector of opposite gender. Other terms commonly used in the industry are mating interface, separable interface and mating face.

Offset: An alignment shift from the center line of the connector

Optional: This term describes features which are not required by the SFF Specification.

Right Angle: A connector design for use with printed circuit board assembly technology where the mating direction is parallel to the plane of the printed circuit board

Single row: A connector design for use with surface mount printed circuit board assembly technology where the termination side points are arranged in one line

Single sided termination: A cable termination assembly style and a connector design style where only one side of the connector is accessible when attaching wires. This style frequently has IDC termination points that point in the same direction.

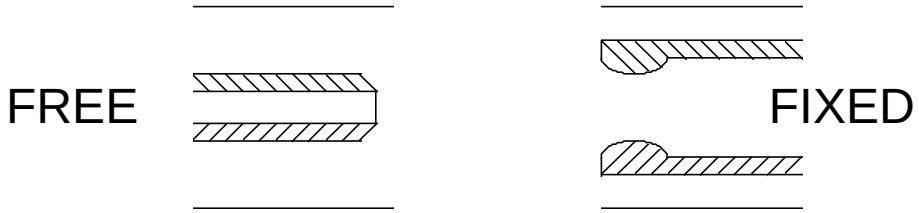
Straddle mount: A connector design style and a printed circuit board design style that uses surface mount termination points on both sides of the board. The connector is frequently centered between the top and bottom surfaces of the board.

Straight: A connector design for use with printed circuit board assembly technology where the mating direction is perpendicular to the plane of the printed circuit board

Surface mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board

Termination side: The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. . Due to pin numbering differences between mating side genders the termination side shall always be specified in conjunction with a mating side of a specific gender. Other terms commonly used in the industry are: back end, non-mating side, footprint, pc board side, and post side

Through hole: A connector design and a printed circuit board design style where the connector termination points penetrates the printed circuit baord and are subsequently soldered to the printed circuit board



THE FREE GENDER IS USED ON THE DEVICE SIDE EXCEPT WHEN USED WITH WIRE TERMINATION

Figure 2 - Mating side gender definition

Annex A contains some explanation and rationalization for the terminology used by EIA for the description of connectors. Since these terms apply largely to the use of the connectors and not directly to the properties of the connectors themselves there is some confusion possible when the connectors are used in certain ways. For example it is perfectly acceptable to use the fixed gender on a cable (thereby making it "free" in the application). This use does not change the name of the gender to "free". Even though the use may not map to the terminology in all cases these terms are adopted in this document for convenience of reference to the EIA

documents. Readers are encouraged to consider the most common applications for the gender when mentally mapping the terminology to the connector properties.

4.2 Conventions

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

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

If any feature defined by the SFF Specification is implemented, it shall be done in a way consistent with other requirements defined by the Specification. Describing a feature as optional in the text is done to assist the reader.

If there is a conflict between figures, text or tables, the table shall be accepted as being correct followed by the text and finally by the figure.

5. Connector descriptions:

5.1 Complete connector options

The complete connectors listed in this section are supported in this document. Most versions apply for both 40 and 80 pin.

There are five kinds of view used to describe a specific connector: (1) the general view of the mating sides, (2) the overview, (3) the outline view, (4) the detailed specifications for the mating or termination sides and (5) the relationship of the board mount features on the connector to key mating interface features.

The general view of the mating sides exists only once in Figure 3.

The overview shows a perspective view of a specific sub-class of connector and is intended to give the reader a feeling for what this sub-class looks like. There are no dimensions in the overview figures.

The outline view specifies the extreme extents of the sub-class size. Some outline view dimensions are not shown in the outline views because the mating interface or the termination interface specifications have these dimensions and there are no duplicate specifications for any feature of the connectors specified in this document.

The detailed specifications exist only once for the mating interfaces as this is a common interface for the SCA-2 family of connectors. Each termination side type has its own detailed specification.

For all board mount connectors a dimension is required to ensure that the mating interface and the termination interface have the same spatial relationship. This is a key part of producing interchangeable connectors.

FREE MATING SIDE CONNECTORS (refer to Figure 37 for mating side specifications):

CONNECTOR NAME	OVERVIEW	OUTLINE	TERMINATION SIDE
FREE CABLE SINGLE SIDED	Figure 28	Figure 29 Figure 30 Figure 31	NA
FREE BOARD STRAIGHT 4-ROW THROUGH HOLE 0.070" TAILS	Figure 12	Figure 13 Figure 14 Figure 15	Figure 41
FREE BOARD STRAIGHT 4-ROW THROUGH HOLE 0.110" TAILS	Figure 12	Figure 13 Figure 14 Figure 15	Figure 41
FREE BOARD STRAIGHT 4-ROW THROUGH HOLE 0.125" TAILS	Figure 12	Figure 13 Figure 14 Figure 15	Figure 41
FREE BOARD STRAIGHT 4-ROW THROUGH HOLE 0.160" TAILS	Figure 12	Figure 13 Figure 14 Figure 15	Figure 41
FREE BOARD STRAIGHT 4-ROW THROUGH HOLE 0.180" TAILS	Figure 12	Figure 13 Figure 14 Figure 15	Figure 41
FREE BOARD RIGHT ANGLE 2-ROW THROUGH HOLE 0.070" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 47 Figure 48
FREE BOARD RIGHT ANGLE 2-ROW THROUGH HOLE 0.110" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 47 Figure 48
FREE BOARD RIGHT ANGLE 2-ROW THROUGH HOLE 0.125" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 47 Figure 48
FREE BOARD RIGHT ANGLE 2-ROW THROUGH HOLE 0.160" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 47 Figure 48
FREE BOARD RIGHT ANGLE 2-ROW THROUGH HOLE 0.180" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 47 Figure 48
FREE BOARD RIGHT ANGLE THROUGH HOLE 4-ROW 0.070" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 44
FREE BOARD RIGHT ANGLE THROUGH HOLE 4-ROW 0.110" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 44
FREE BOARD RIGHT ANGLE THROUGH HOLE 4-ROW 0.125" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 44
FREE BOARD RIGHT ANGLE THROUGH HOLE 4-ROW 0.160" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 44
FREE BOARD RIGHT ANGLE THROUGH HOLE 4-ROW 0.180" TAILS	Figure 16	Figure 17 Figure 18 Figure 19	Figure 44

FREE MATING SIDE CONNECTORS continued (refer to Figure 37 for mating side specifications):

CONNECTOR NAME	OVERVIEW	OUTLINE	TERMINATION SIDE
FREE BOARD STRADDLE MOUNT (1 mm board and 1.57 mm board)	Figure 20	Figure 21 Figure 22 Figure 23	Figure 45
FREE BOARD STRADDLE MOUNT OFFSET (1mm board and 1.57 mm board)	Figure 20	Figure 21 Figure 22 Figure 23	Figure 45
FREE BOARD RIGHT ANGLE SURFACE MOUNT (1-ROW)	Figure 16	Figure 17 Figure 18 Figure 19	Figure 42 Figure 43
FREE BOARD RIGHT ANGLE SURFACE MOUNT (2-ROW)	Figure 16	Figure 17 Figure 18 Figure 19	Figure 46

FIXED MATING SIDE CONNECTORS (used on the device side except when used with cable terminations) (Refer to Figure 36 for mating side specifications):

CONNECTOR NAME	OVERVIEW	OUTLINE	TERMINATION SIDE
FIXED CABLE STRAIGHT	Figure 24	Figure 25 Figure 26 Figure 27	NA
FIXED BOARD STRAIGHT REGULAR 4-ROW THROUGH HOLE 0.070´TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT REGULAR 4-ROW THROUGH HOLE 0.110" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT REGULAR 4-ROW THROUGH HOLE 0.125" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT REGULAR 4-ROW THROUGH HOLE 0.160" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT REGULAR 4-ROW THROUGH HOLE 0.180" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT EXTENDED 4-ROW THROUGH HOLE 0.070" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT EXTENDED 4-ROW THROUGH HOLE 0.110" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT EXTENDED 4-ROW THROUGH HOLE 0.125" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT EXTENDED 4-ROW THROUGH HOLE 0.160" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD STRAIGHT EXTENDED 4-ROW THROUGH HOLE 0.180" TAILS	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD REGULAR SOLDERLESS 4-ROW THROUGH HOLE	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38
FIXED BOARD EXTENDED SOLDERLESS 4-ROW THROUGH HOLE	Figure 4	Figure 5 Figure 6 Figure 7	Figure 38

FIXED MATING SIDE CONNECTORS continued (used on the device side except when used with cable terminations) (Refer to Figure 36 for mating side specifications):

CONNECTOR NAME	OVERVIEW	OUTLINE	TERMINATION SIDE
FIXED BOARD RIGHT ANGLE REGULAR 4-ROW THROUGH HOLE 0.070" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE REGULAR 4-ROW THROUGH HOLE 0.110" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE REGULAR 4-ROW THROUGH HOLE 0.125" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE REGULAR 4-ROW THROUGH HOLE 0.160" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE REGULAR 4-ROW THROUGH HOLE 0.180" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE EXTENDED 4-ROW THROUGH HOLE 0.070" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE EXTENDED 4-ROW THROUGH HOLE 0.110" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE EXTENDED 4-ROW THROUGH HOLE 0.125" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE EXTENDED 4-ROW THROUGH HOLE 0.160" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE EXTENDED 4-ROW THROUGH HOLE 0.180" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 39
FIXED BOARD RIGHT ANGLE REGULAR 2-ROW THROUGH HOLE 0.070" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE REGULAR 2-ROW THROUGH HOLE 0.110" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE REGULAR 2-ROW THROUGH HOLE 0.125" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE REGULAR 2-ROW THROUGH HOLE 0.160" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE REGULAR 2-ROW THROUGH HOLE 0.180" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE EXTENDED 2-ROW THROUGH HOLE 0.070" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE EXTENDED 2-ROW THROUGH HOLE 0.110" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE EXTENDED 2-ROW THROUGH HOLE 0.125" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE EXTENDED 2-ROW THROUGH HOLE 0.160" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40
FIXED BOARD RIGHT ANGLE EXTENDED 2-ROW THROUGH HOLE 0.180" TAILS	Figure 8	Figure 9 Figure 10 Figure 11	Figure 40

The dimensional requirements for mating interface displacements are shown in Figure 32. The contact length relationships are shown in Figure 33. The mating dimensions are shown in Figure 34.

The relevant figures from EIA-700A0AE (SP-3651) are duplicated for reference below: Only the physical dimensions and a table of the most important performance requirements are included.

5.2 Performance and compatibility requirements

SCA-2 connectors shall meet the performance requirements specified in EIA-700A0AE (SP-3651). Some of these are summarized in Table 1 and Table 2.

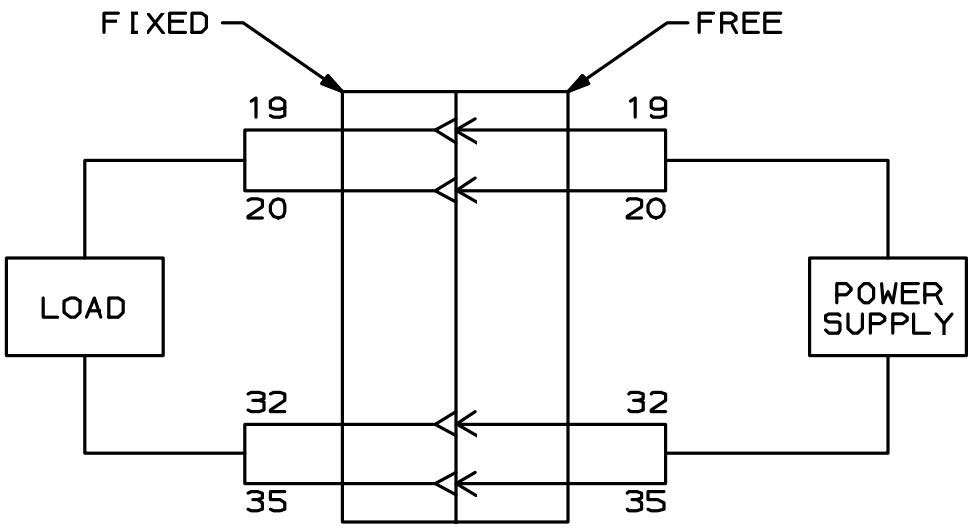
Table 1 - Some performance requirements for SCA-2 connectors

PARAMETER	REQUIREMENTS
RATED VOLTAGE	250 V rms
CURRENT RATINGS	See Table 2
INSULATION RESISTANCE	1000 megohms min
AMBIENT TEMPERATURE	-55°C to 85°C
MATING CYCLES	500 min
CONTACT RESISTANCE NON-AGC CONTACTS	< 35 milliohms
CONTACT RESISTANCE AGC CONTACTS	< 50 milliohms

Table 2 - Contact current rating requirements

Number of contacts	Current, amps	Voltage, volts	Contact number with voltage applied (in parallel)	Contact number with ground (in parallel)
40	2	5	19, 20	32, 35
40	2.5	12	2, 3, 4	22, 23, 26, 29
80	2	5	34, 35	75, 76
80	3	12	2, 3, 4	41, 42, 43

Notes: (1) Current levels are based on steady state conditions. When the connector is used in "hot plug" applications, current spikes shall be minimized using a current limiting device.
(2) Example shown below for a 40 contact connector on 2 amp, 5 volt contacts.
(3) The Advanced Grounding Contacts were originally designed to provide ESD protection and equipment grounding only, but because of system tolerances may sometimes be the first ground return path for the power supply instead of the normal sequenced ground contacts.
There is no implied current rating for these contacts and it is not recommended that the Advanced Grounding Contacts be used as a current path in the power circuit.



The process of mating an SCA-2 connector pair should be accomplished in a “free fit” manner where no excessive mechanical stresses are placed on the connectors during or after the mating process. The mating process should be considered in the context of the packaging surrounding the device with the SCA-2 connector. Stresses considered include those transmitted to the mated connector through the device: for example, the weight of the drive, that resulting from resilient device guide members in the enclosure, the device retention mechanism, acceleration stresses (mechanical shock testing) and interference with enclosure parts. Mechanical interference between the device with the mated SCA-2 connectors and fixed or solid parts of the packaging will generally not be tolerated by the SCA-2 system.

The mating interface specifications require a three stage process to arrive at the final mated contact:

The first stage must be delivered by the device enclosure system to achieve center to center alignment of less than 2.0 mm prior to any part of the SCA-2 connector pair engaging.

The second stage (connector blind mate pre-alignment features) positions the connectors from ±2.0 mm at initial engagement through a process influenced by the following dimensions: A19, A20 and A23 in Figure 36 and A24, A27, A29, and A30 in Figure 37.

The third stage further positions the connectors to their final mated position through a process influenced by the following dimensions: A1, A4, A5, A6, A7, and A11 in Figure 36 and A1, A3, A8, A9, A11, and A13 in Figure 37.

Connector designers should recognize that certain lateral movement between free gender contacts and fixed gender contacts may occur between the time the pre-alignment features engage and the contacts reach the final mated position.

The positional requirements in Figure 34 and Figure 35 define the fully mated condition.

All dimensions in this document apply to the unmated finished product (after assembly to printed circuit boards / backplanes).

While the SCA-2 connectors in this document should intermate with those termed “SCA-1” there is no specification to control the SCA-1 dimensions and the lead-in features and the different contact position lengths are not present on the SCA-1 connectors. It is therefore recommended that SCA-2 connectors not be used with SCA-1 connectors in a blind mating application.

CAUTION:

When mating SCA connectors without the aid of guide rails (or other premating guiding systems not part of the SCA-2 connector) there is a risk of shorting signals to power. This event may damage the devices on either side of the connector.

The physical compatibility requirements for use with printed circuit boards are given in Table 3. Board thicknesses and/or assembly processes that require tail lengths other than that given in Table 3 are not compatible with the connectors defined in this document.

Table 3 - Printed circuit board compatibility requirements

TERMINATION SIDE STYLE	PRINTED CIRCUIT BOARD THICKNESS	
	MIN (MM / INCHES)	MAX (MM /INCHES)
SURFACE MOUNT *	1.01 / 0.040	1.27 / 0.050
THROUGH HOLE A (0.070 TAILS)	0.85 / 0.033	1.15 / 0.045
THROUGH HOLE B (0.110 TAILS)	1.42 / 0.056	1.72 / 0.068
THROUGH HOLE C (0.125 TAILS)	2.21 / 0.087	2.51 / 0.099
THROUGH HOLE D (0.160 TAILS)	3.03 / 0.119	3.33 / 0.131
THROUGH HOLE E (0.180 TAILS)	3.66 / 0.144	3.96 / 0.156
THROUGH HOLE SOLDERLESS **	**	**
STRADDLE MOUNT A	0.87 / 0.034	1.13 / 0.044
STRADDLE MOUNT B	1.44 / 0.057	1.70 / 0.067
* This dimension is required to accommodate board retention features that penetrate the board		
** The connector pin properties shall be designed to work with these board specifications and are not otherwise specified Finished hole size: 0.72 / 0.028 min 0.88 / 0.035 max (same as Thru hole size) Board Thickness: 1.57 / 0.062 min 3.17 / 0.125 max Solder thickness: per IPC hole plating specification Copper thickness: per IPC hole plating specification		

5.3 Dimensional requirements

The drawings in this section use the dimensioning conventions described in ANSI-Y14.5M, Dimensioning and tolerancing. All dimensions are in millimeters.

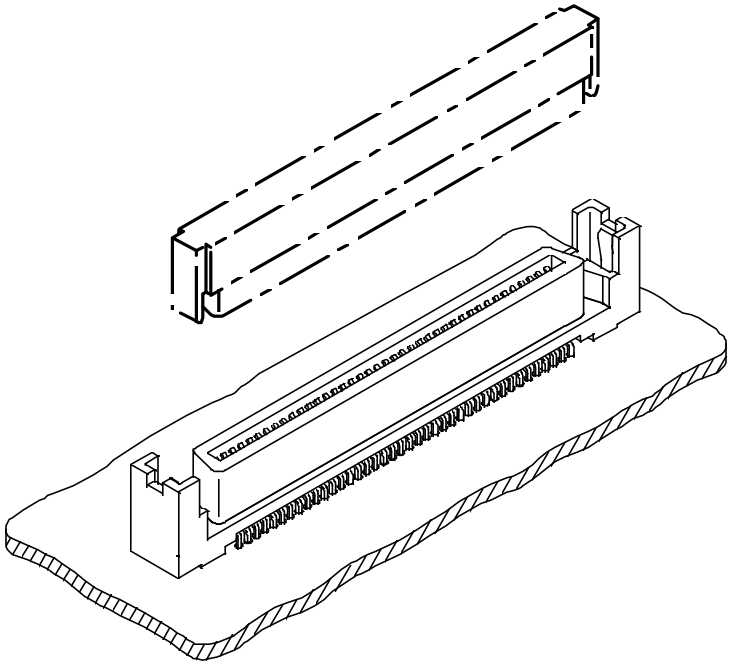


Figure 3 - General view of mating sides

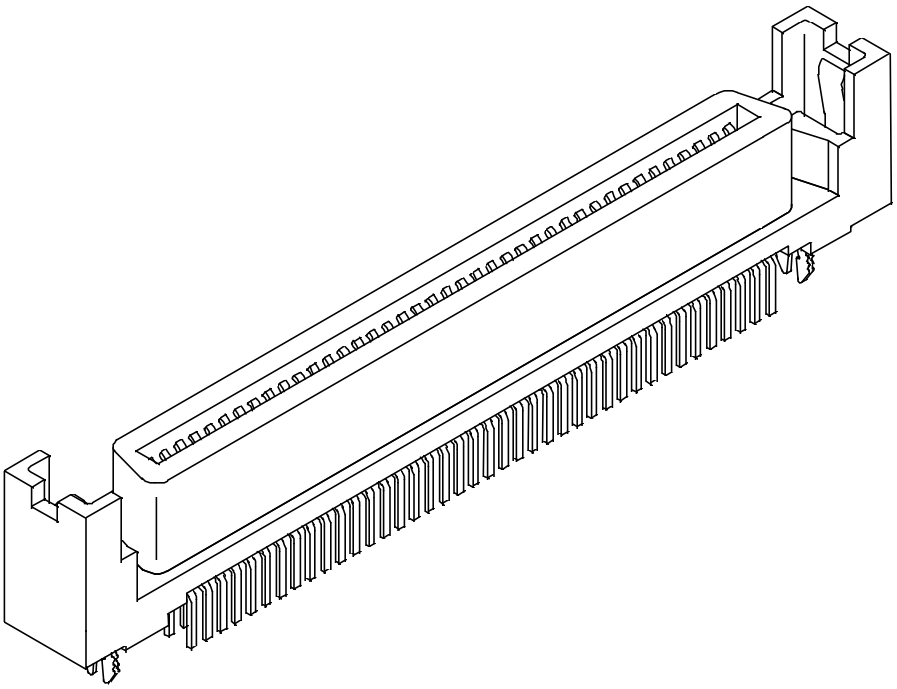


Figure 4 - Fixed board straight overview

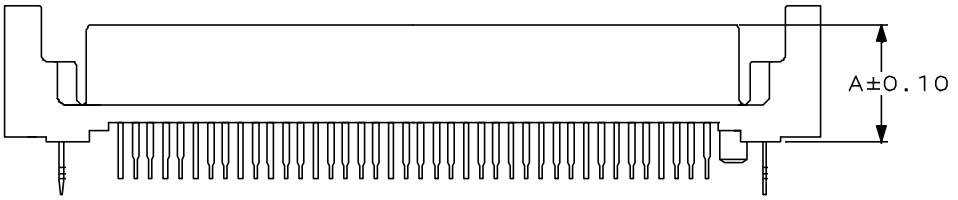


Figure 5 - Front view fixed board straight (regular and extended)

Regular A = 9.85 mm; Extended A = 15.85 mm

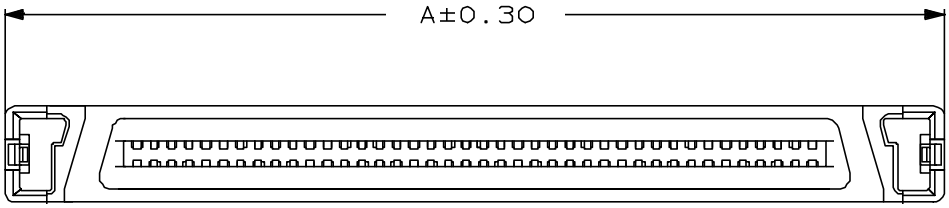


Figure 6 - Top view fixed board straight (regular and extended)

40 pin A = 43.60; 80 pin A = 69.00

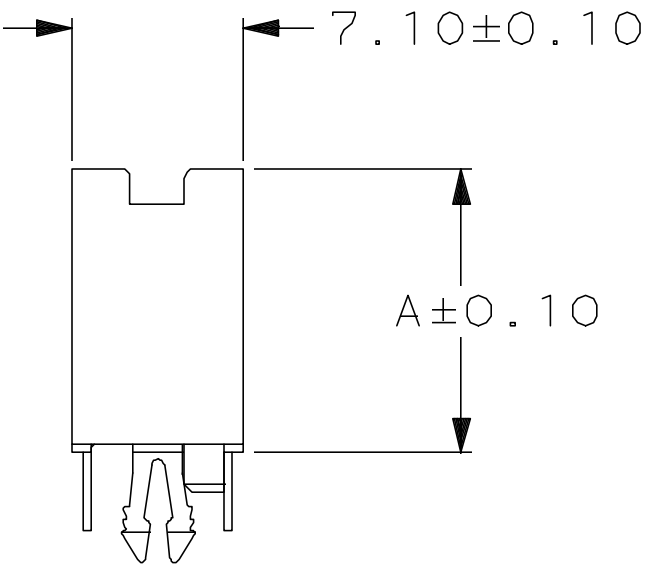


Figure 7 - Side view fixed board straight (regular and extended)

Regular A = 11.50 mm; Extended A = 17.50 mm

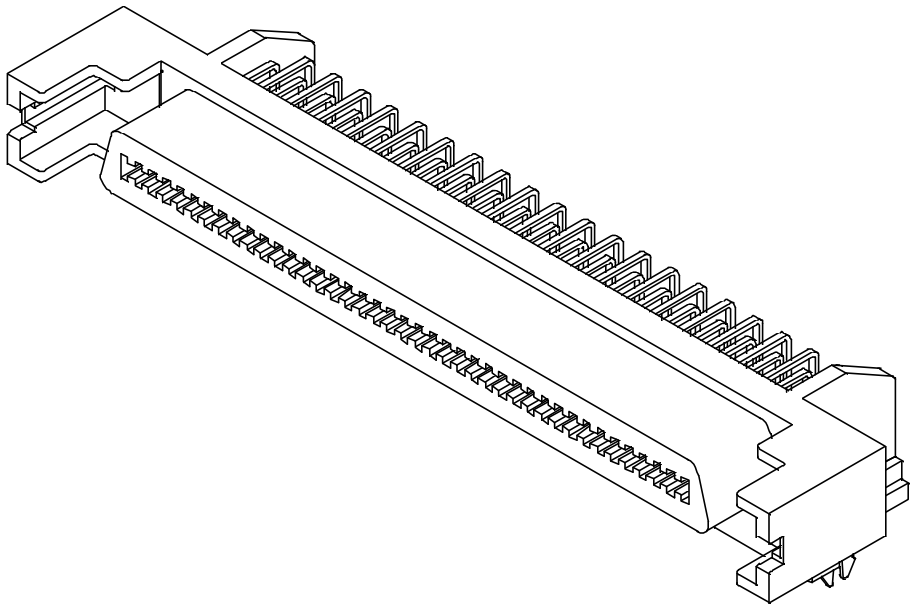


Figure 8 - Fixed board right angle overview

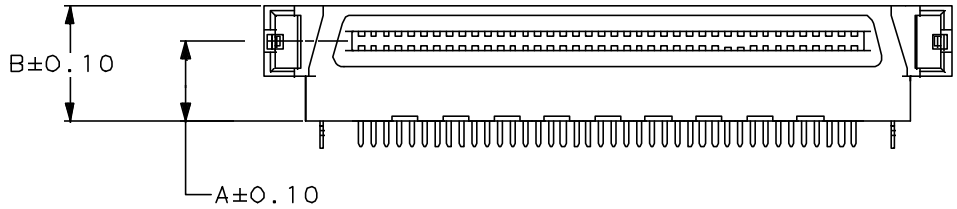


Figure 9 - Fixed board right angle outline (front view)

40 pos and 80 pos standard A = 3.80 mm, B = 7.60 mm
40 pos and 80 pos extended A = 8.00 mm, B = 11.50 mm

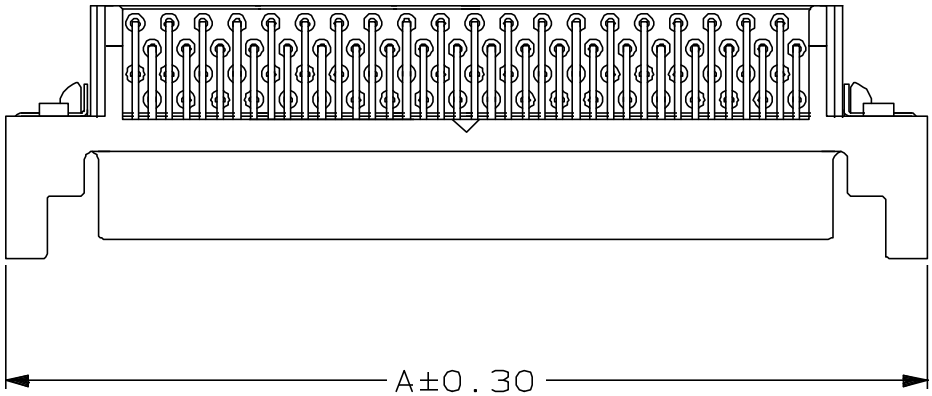


Figure 10 -Fixed board right angle outline (top view)

Regular and extended A = 43.60 for 40 pos, 69.00 for 80 pos

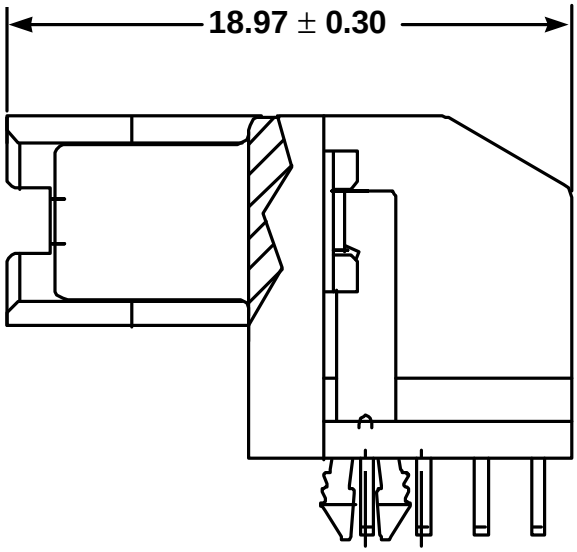


Figure 11 - Fixed board right angle outline (side view)

Figure 11 applies for all termination types - 4 row thru hole shown.

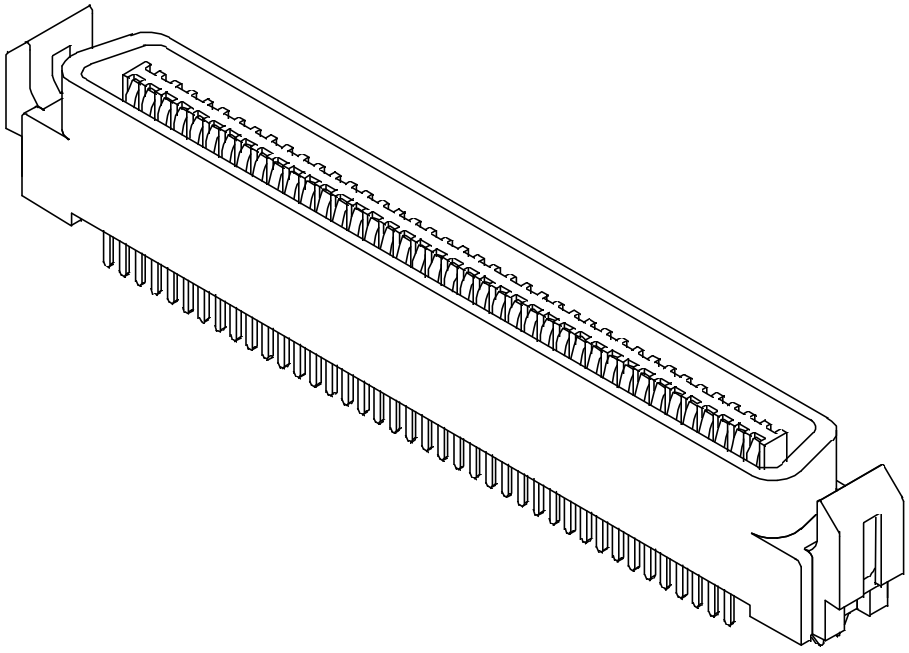


Figure 12 - Free board straight overview

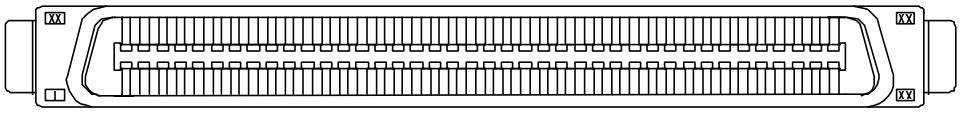


Figure 13 - Free board straight outline (front view)

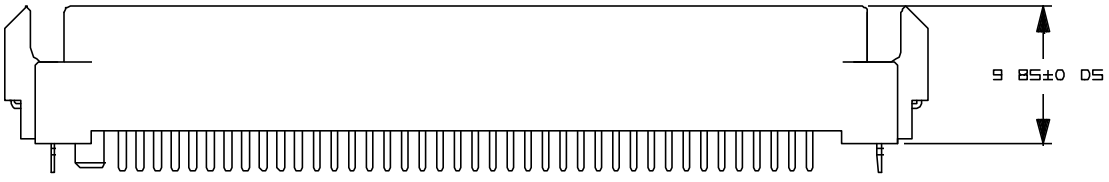


Figure 14 - Free board straight outline (top view)

Outline dimensions controlled by Figure 37.

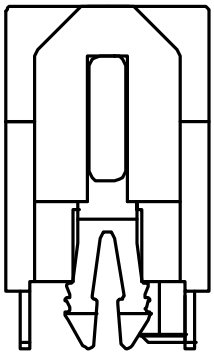


Figure 15 - Free board straight outline (side view)

The outline dimensions for Figure 15 are controlled by Figure 37.

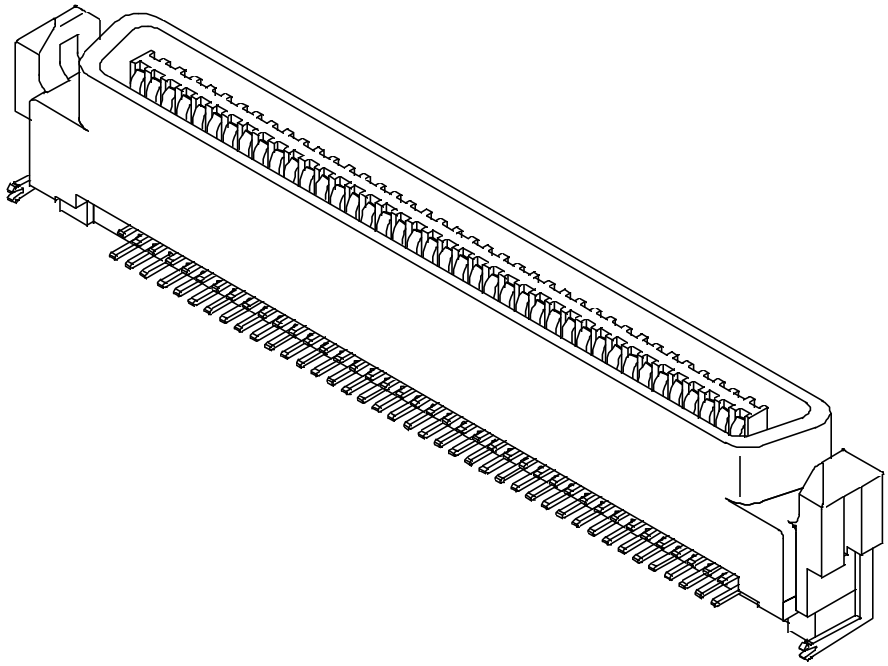


Figure 16 - Free board right angle overview

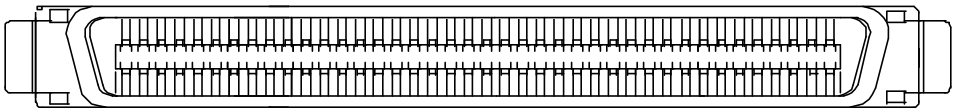


Figure 17 - Free board right angle outline (front view)

Outline dimensions controlled by Figure 37.

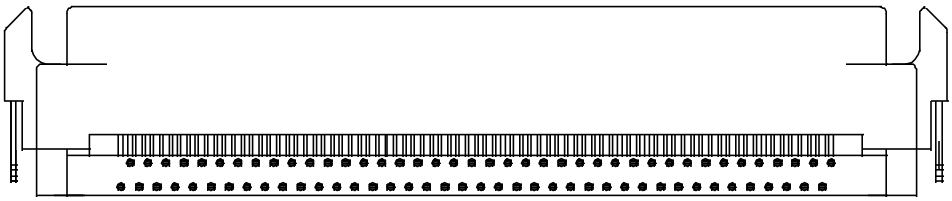


Figure 18 - Free board right angle outline (top view)

Outline dimensions controlled by Figure 37.

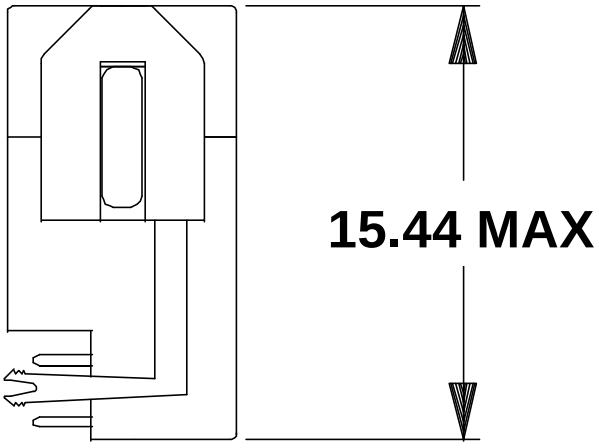


Figure 19 - Free board right angle outline (side view)

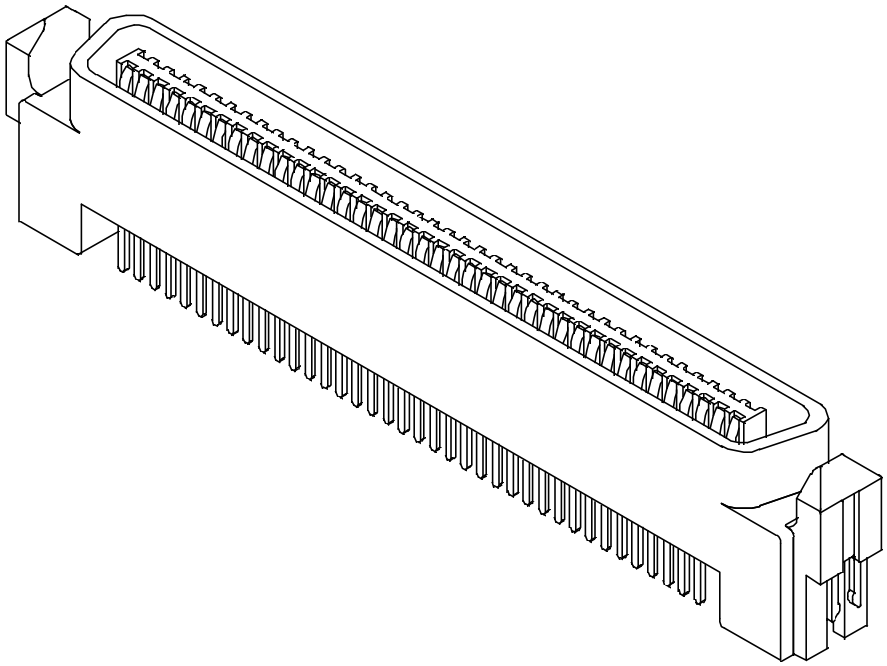


Figure 20 - Free board straddle mount overview

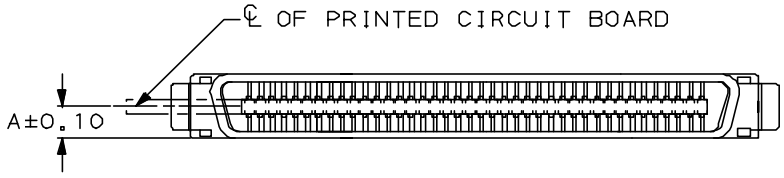


Figure 21 - Free board straddle mount outline (front view)

Straddle mount A = 3.50 mm; Straddle mount offset A = 3.85 mm
Outline dimensions controlled by Figure 37.

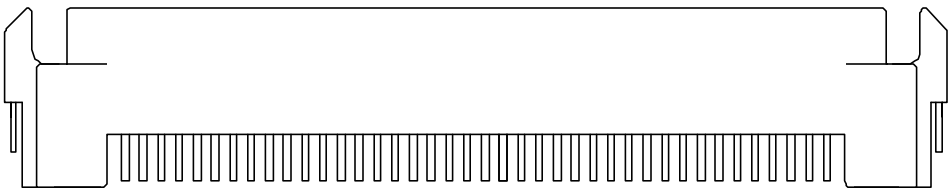


Figure 22 - Free board straddle mount outline (top view)

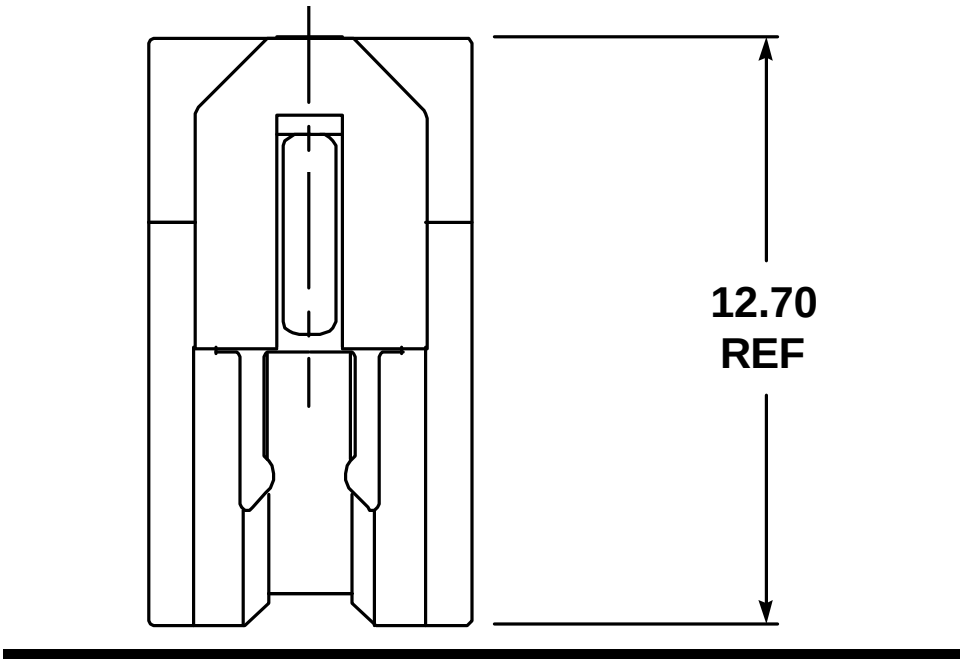


Figure 23 - Free board straddle mount outline (side view)

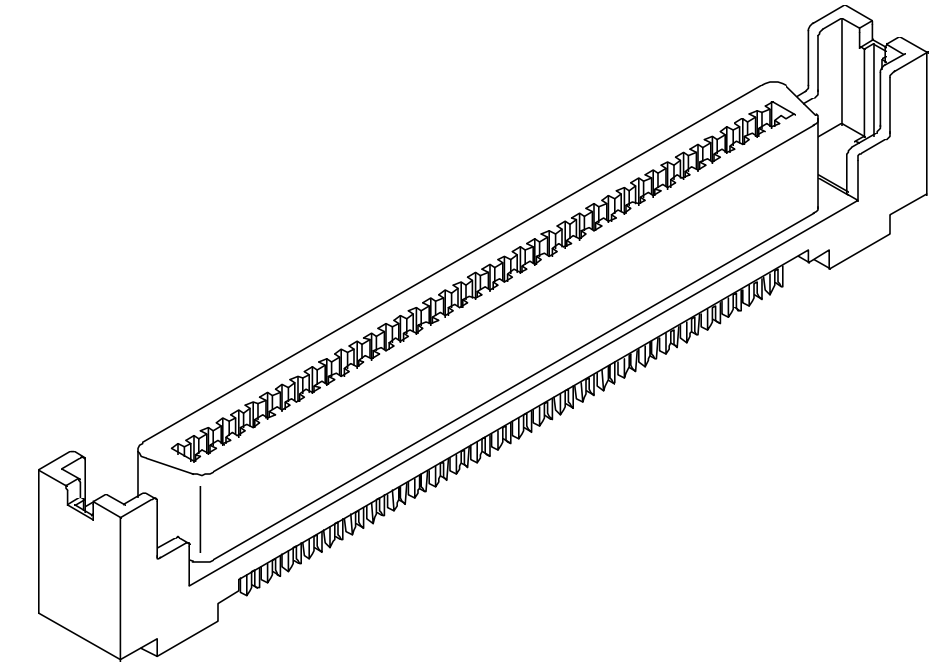


Figure 24 - Fixed cable straight overview

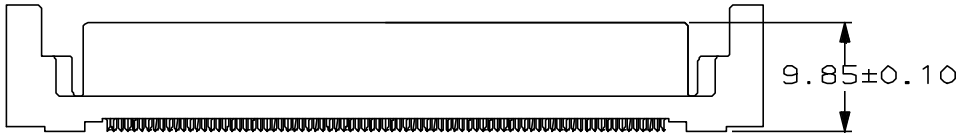


Figure 25 - Fixed cable straight outline (front view)

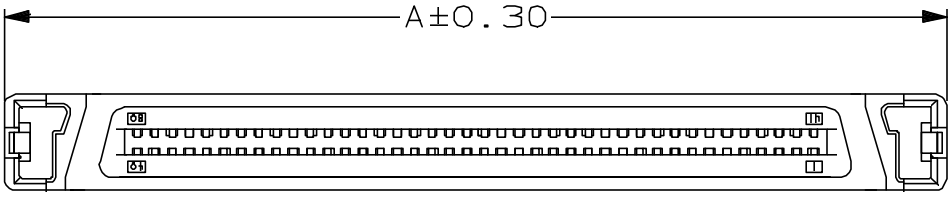


Figure 26 - Fixed cable straight outline (top view)

40 pos A = 43.60; 80 pos A = 69.00

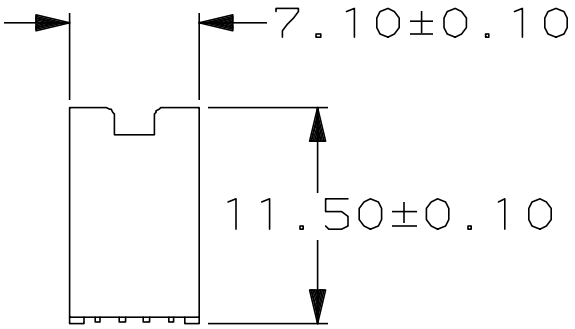


Figure 27 - Fixed cable straight outline (side view)

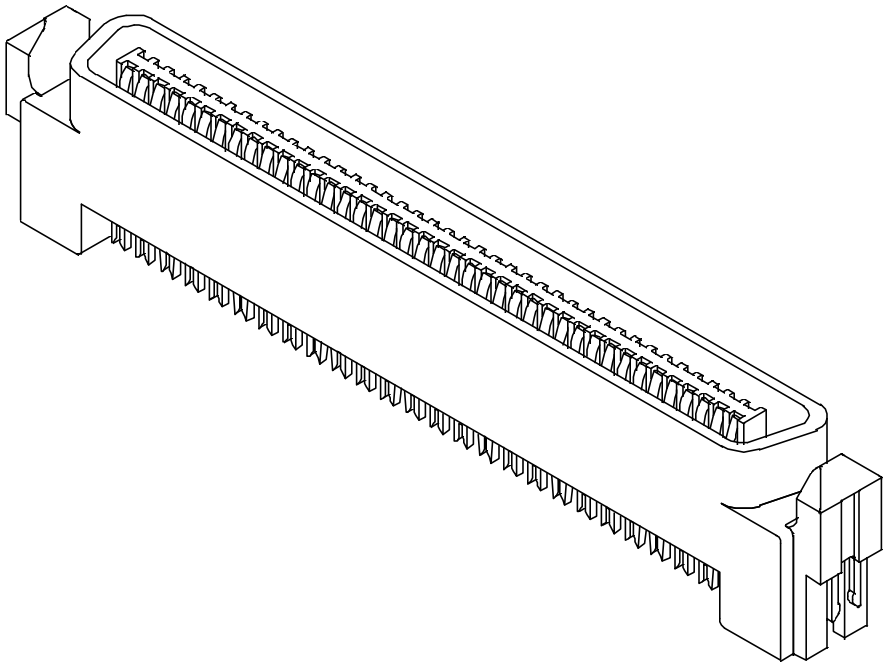


Figure 28 - Free cable straight overview

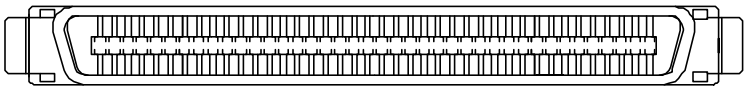


Figure 29 - Free cable straight outline (front view)

Outline dimensions are controlled by Figure 37.

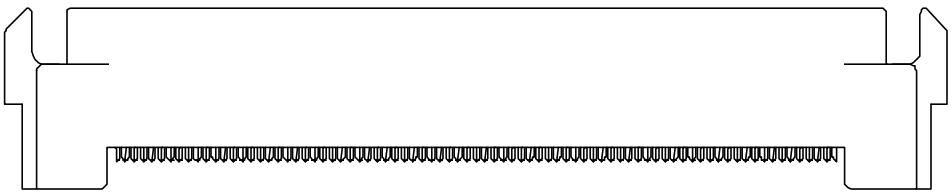


Figure 30 - Free cable straight outline (top view)

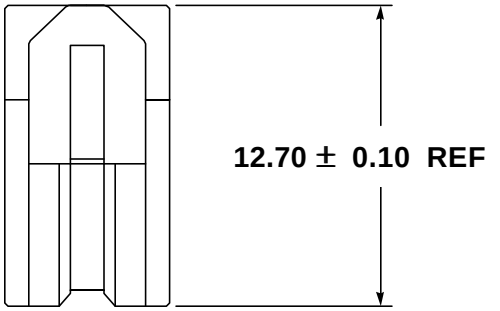


Figure 31 - Free cable straight outline (side view)

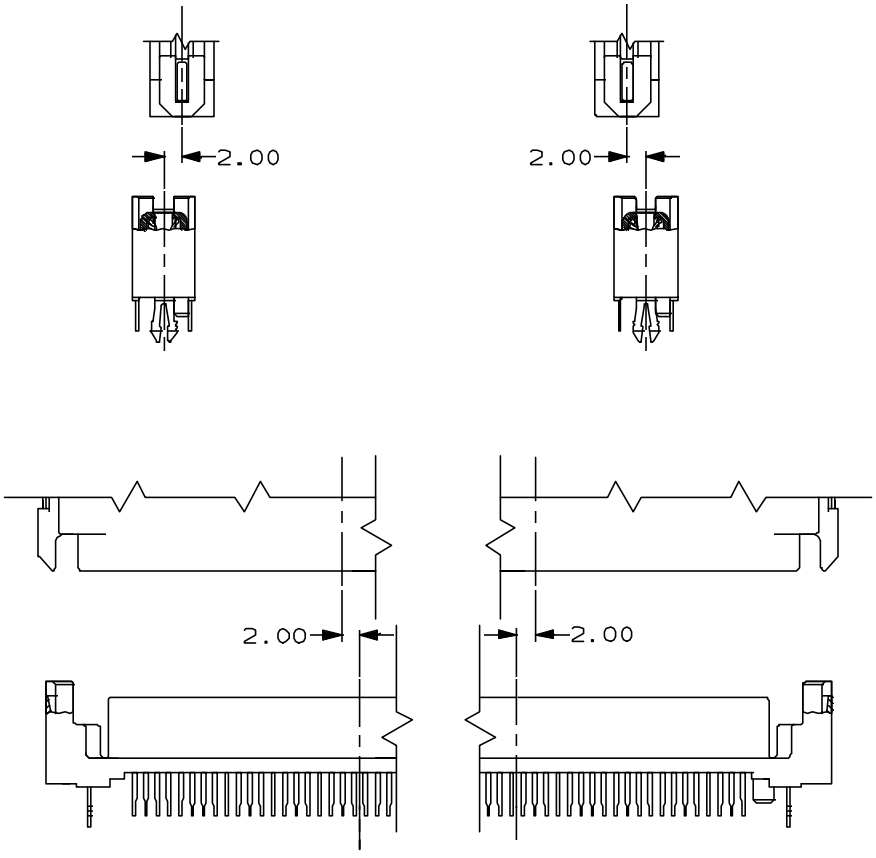


Figure 32 - Connector displacement

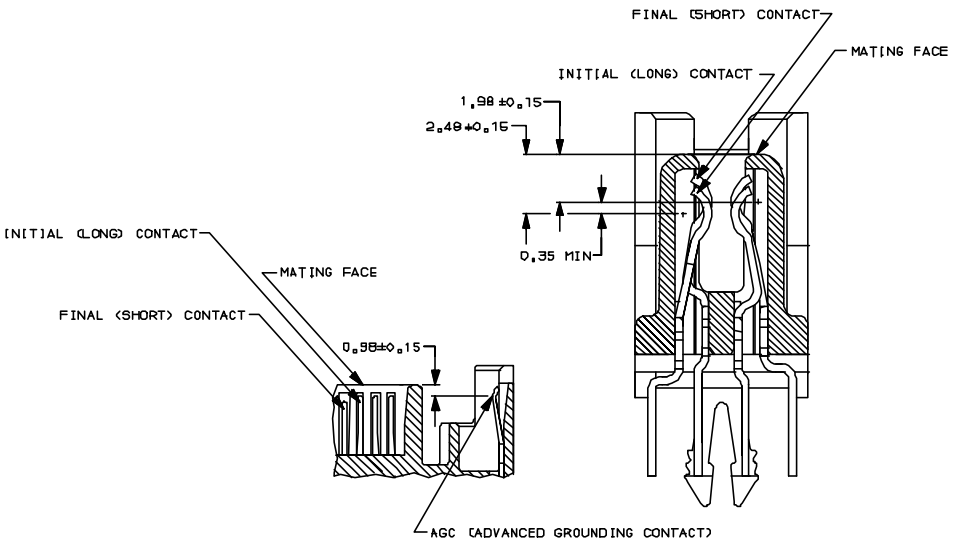


Figure 33 - Contact levels

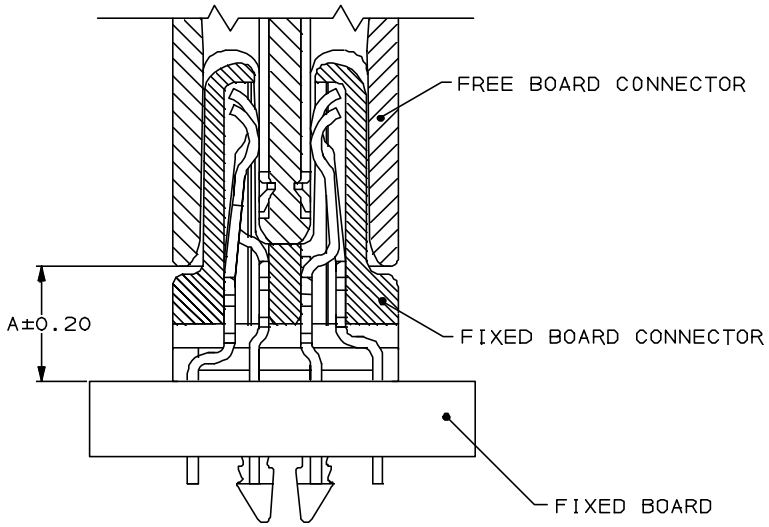


Figure 34 - Fully mated dimensions

Standard height 40 and 80 position A = 3.55
Extended height 40 and 80 position A = 9.55

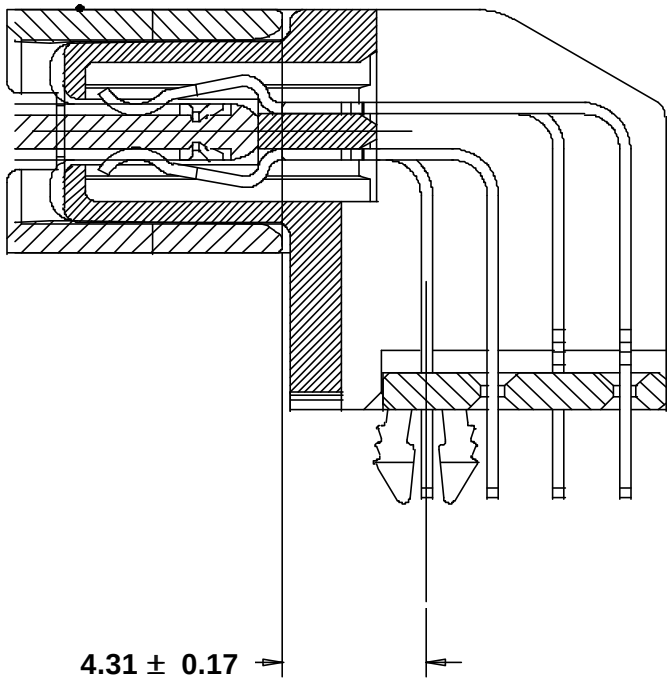


Figure 35 - Right angle mating dimensions

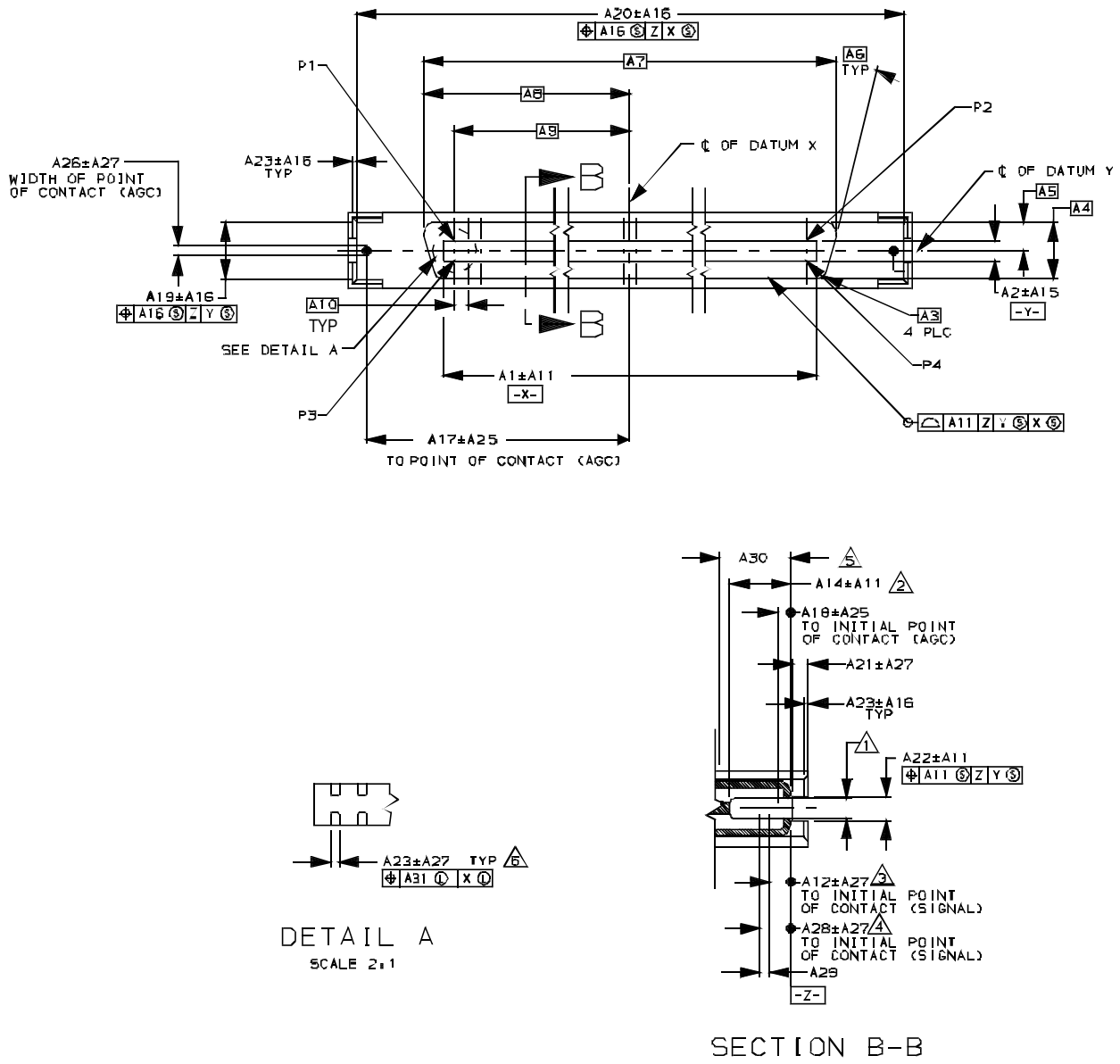


Figure 36 - Mating interface fixed gender

See Table 4 for 40 position dimensions and notes and Table 5 for 80 position dimensions and notes.

Table 4 - Dimensions and notes for 40 position fixed gender interface

△1 CONTACT GAP WILL ACCOMMODATE MATING CONNECTOR OF A13±A16.

△2 INTERNAL CLEARANCE FOR MATING CONNECTOR

△3 SEQUENCED (FIRST MATE) CONTACT

△4 SEQUENCED (SECOND MATE) CONTACT

△5 EXTERNAL CLEARANCE FOR MATING CONNECTOR

△6 EFFECTIVE WIDTH OF THE POINT OF CONTACT ZONE

40 POSITION		
P1 = POSITION 1	P3 = POSITION 21	
P2 = POSITION 20	P4 = POSITION 40	

DIMENSION	MILLIMETERS	INCHES	
A1	26.03	1.025	
A2	1.90	.075	
A3	1.00 R	.039 R	
A4	5.05	.199	
A5	2.525	.0995	
A6	15°	15°	
A7	29.67	1.168	
A8	14.84	.584	
A9	12.065	.475	
A10	1.27	.050	
A11	0.10	.004	
A12	1.98	.078	△3
A13	1.60	.063	
A14	5.70	.224	
A15	0.05	.002	
A16	0.08	.003	
A17	20.10	0.791	
A18	0.98	.039	
A19	5.30	.209	
A20	41.40	1.630	
A21	1.45	.057	
A22	2.20	.087	
A23	0.40	.016	
A24	0.28	.011	
A25	0.15	.006	
A26	0.95	.037	
A27	0.15	.006	
A28	2.48	.098	△4
A29	0.35 MIN	.014 MIN	
A30	6.50 MIN	.256 MIN	
A31	0.30	.012	

Table 5 - Dimensions and notes for 80 position fixed gender interface

1 **CONTACT GAP WILL ACCOMMODATE MATING CONNECTOR OF A13±A16.**

2 **INTERNAL CLEARANCE FOR MATING CONNECTOR**

3 **SEQUENCED (FIRST MATE) CONTACT**

4 **SEQUENCED (SECOND MATE) CONTACT**

5 **EXTERNAL CLEARANCE FOR MATING CONNECTOR**

6 **EFFECTIVE WIDTH OF THE POINT OF CONTACT ZONE**

80 POSITION	
P1 = POSITION 1	P3 = POSITION 41
P2 = POSITION 40	P4 = POSITION 80

DIMENSION	MILLIMETERS	INCHES	
A1	51.43	2.025	
A2	1.90	.075	
A3	1.00 R	.039 R	
A4	5.05	.199	
A5	2.525	.0995	
A6	15°	15°	
A7	55.07	2.168	
A8	27.54	1.084	
A9	24.765	.9750	
A10	1.27	.050	
A11	0.10	.004	
A12	1.98	.078	3
A13	1.60	.063	
A14	5.70	.224	
A15	0.05	.002	
A16	0.08	.003	
A17	32.80	1.291	
A18	0.98	.039	
A19	5.30	.209	
A20	66.80	2.630	
A21	1.45	.057	
A22	2.20	.087	
A23	0.40	.016	
A24	0.28	.011	
A25	0.15	.006	
A26	0.95	.037	
A27	0.15	.006	
A28	2.48	.098	4
A29	0.35 MIN	.014 MIN	
A30	6.50 MIN	.256 MIN	
A31	0.30	.012	

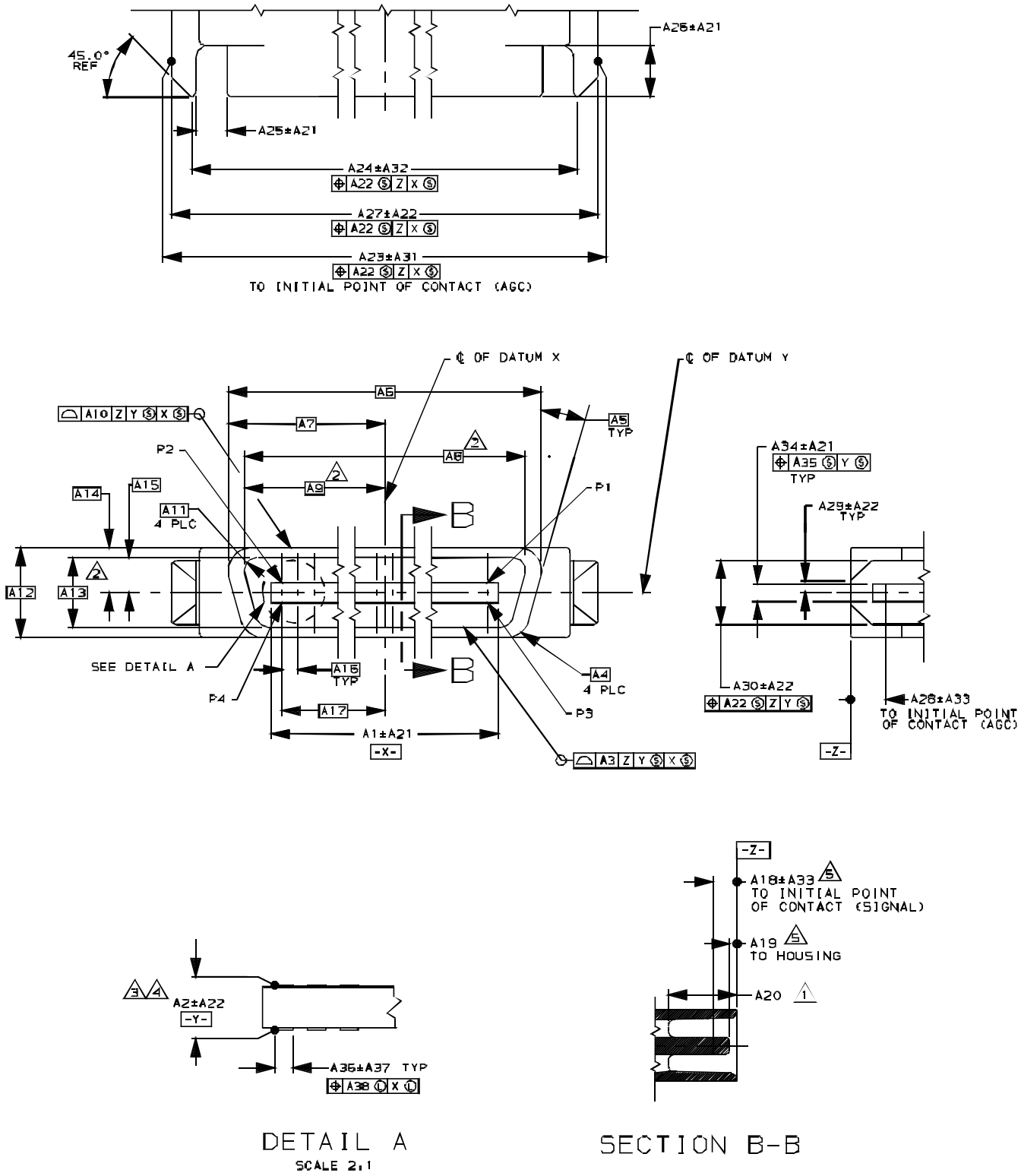


Figure 37 - Mating interface free gender

See Table 6 for 40 position dimensions and notes and Table 7 for 80 position dimensions and notes.

Table 6 - Dimensions and notes for 40 position free gender interface

1. INTERNAL CLEARANCE FOR MATING CONNECTOR
2. MEASURED AT A20 DIMENSION.
3. DISTANCE MEASURED ACROSS CONTACT MATING SURFACES ALONG EFFECTIVE MATING AREA
4. CONTACT MUST BE ABOVE PLASTIC ALONG EFFECTIVE MATING AREA.
5. 0.75MM MIN PLASTIC LEAD-IN PRIOR TO INITIAL POINT OF CONTACT (SIGNAL)
   A2±A22 THICKNESS REQUIRED FOR PRE-DEFLECTION OF RECEPTACLE CONTACTS

40 POSITION		
P1 = POSITION 1	P3 = POSITION 21	
P2 = POSITION 20	P4 = POSITION 40	
DIMENSION	**MILLIMETERS**	**INCHES**
A1	25.77	1.015
A2	1.60	.063
A3	0.10	.004
A4	1.80 R	.071 R
A5	15°	15°
A6	32.47	1.278
A7	16.235	.639
A8	29.87	1.176
A9	14.935	.588
A10	0.20	.008
A11	1.00 R	.039 R
A12	7.00	.276
A13	5.325	.210 (2)
A14	3.50	.138
A15	2.663	.105
A16	1.27	.050
A17	12.065	.475
A18	2.00	.079
A19	0.60 MIN	.024 MIN
A20	6.50 MIN	.256 MIN
A21	0.10	.004
A22	0.08	.003
A23	41.00	1.614
A24	37.90	1.492
A25	2.42	.095
A26	4.00	.157
A27	41.10	1.618
A28	1.85	.073
A29	0.90	.035
A30	5.00	.197
A31	0.28	.011
A32	0.24	.009
A33	0.25	.010
A34	1.35	.053
A35	0.05	.002
A36	0.80	.031
A37	0.15	.006
A38	0.13	.005

Table 7 - Dimensions and notes for 80 position free gender interface

△1 **INTERNAL CLEARANCE FOR MATING CONNECTOR**

△2 **MEASURED AT A20 DIMENSION.**

△3 **DISTANCE MEASURED ACROSS CONTACT MATING SURFACES ALONG EFFECTIVE MATING AREA**

△4 **CONTACT MUST BE ABOVE PLASTIC ALONG EFFECTIVE MATING AREA.**

△5 **0.75MM MIN PLASTIC LEAD-IN PRIOR TO INITIAL POINT OF CONTACT (SIGNAL) A2±A22 THICKNESS REQUIRED FOR PRE-DEFLECTION OF RECEPTACLE CONTACTS**

80 POSITION		
P1 = POSITION 1	P3 = POSITION 41	
P2 = POSITION 40	P4 = POSITION 80	
DIMENSION	MILLIMETERS	INCHES
A1	51.17	2.015
A2	1.60	.063
A3	0.10	.004
A4	1.80 R	.071 R
A5	15°	15°
A6	57.87	2.278
A7	28.935	1.139
A8	55.27	2.176
A9	27.635	1.088
A10	0.20	.008
A11	1.00 R	.039 R
A12	7.00	.276
A13	5.325	.210 △2
A14	3.50	.138
A15	2.663	.105
A16	1.27	.050
A17	24.765	.975
A18	2.00	.079
A19	0.60 MIN	.024 MIN
A20	6.50 MIN	.256 MIN
A21	0.10	.004
A22	0.08	.003
A23	66.40	2.614
A24	63.30	2.492
A25	2.42	.095
A26	4.00	.157
A27	66.50	2.618
A28	1.85	.073
A29	0.90	.035
A30	5.00	.197
A31	0.28	.011
A32	0.24	.009
A33	0.25	.010
A34	1.35	.053
A35	0.05	.002
A36	0.80	.031
A37	0.15	.006
A38	0.13	.005

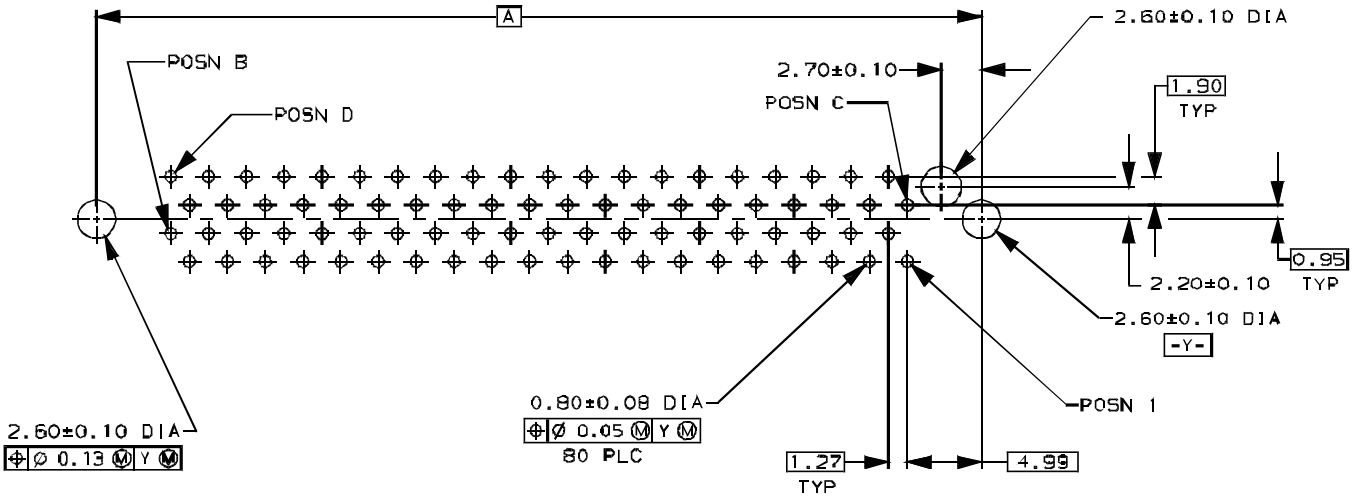


Figure 38 - Fixed board straight 4-row through hole

Use for both solder and solderless applications.

Version	A	position B	position C	Position D
40 position	34.11	20	21	40
80 position	59.51	40	41	80

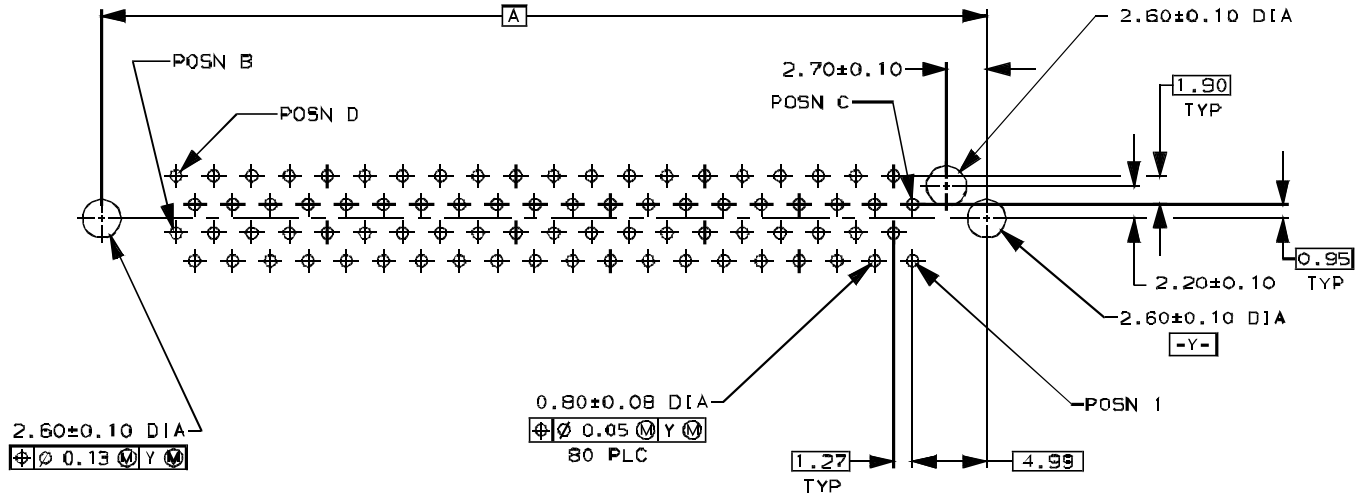


Figure 39 - Fixed board right angle 4-row through hole

Version	A	position B	position C	Position D
40 position	31.53	20	21	40
80 position	56.93	40	41	80

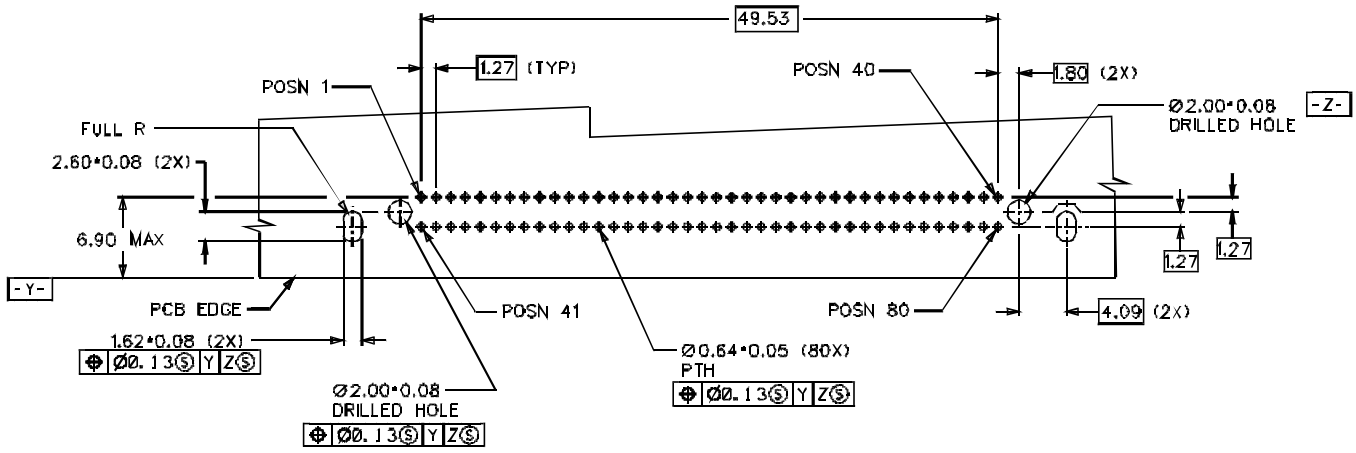


Figure 40 - Fixed board right angle 2-row through hole

NOTE: ONLY 80 POSITION SPECIFIED

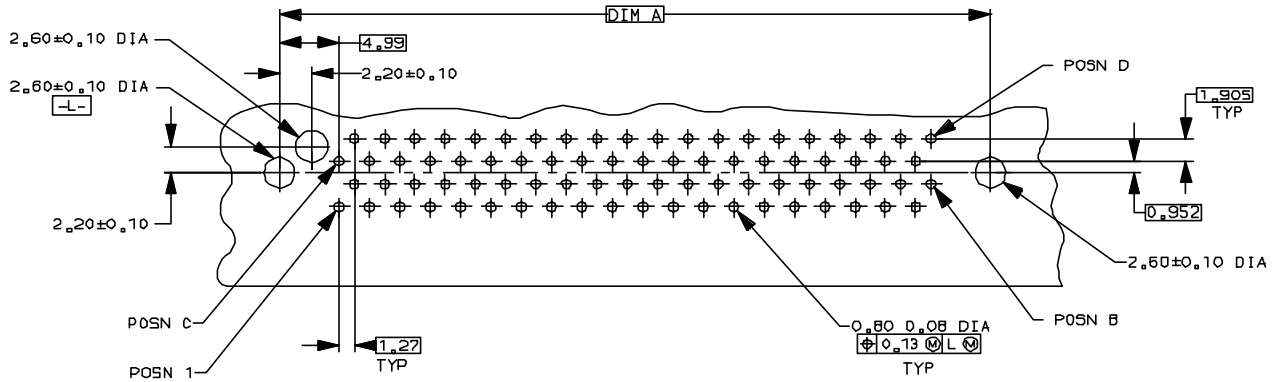


Figure 41 - Free board straight 4-row through hole

Version	DIM A	Position B	Position C	Position D
40 position	34.11	20	21	40
80 position	59.51	40	41	80

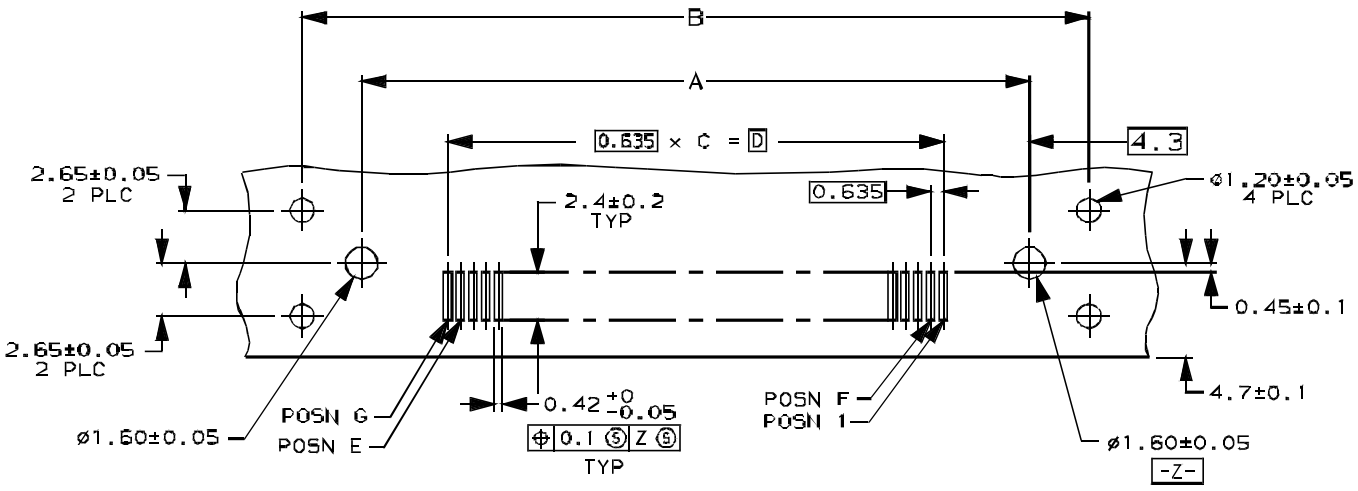


Figure 42 - Free board right angle 1-row surface mount (version 1)

Version	A	B	C	D	position E	position F	Position G
40 position	33.365	30.7	39	24.765	20	21	40
80 position	58.765	64.7	79	50.165	40	41	80

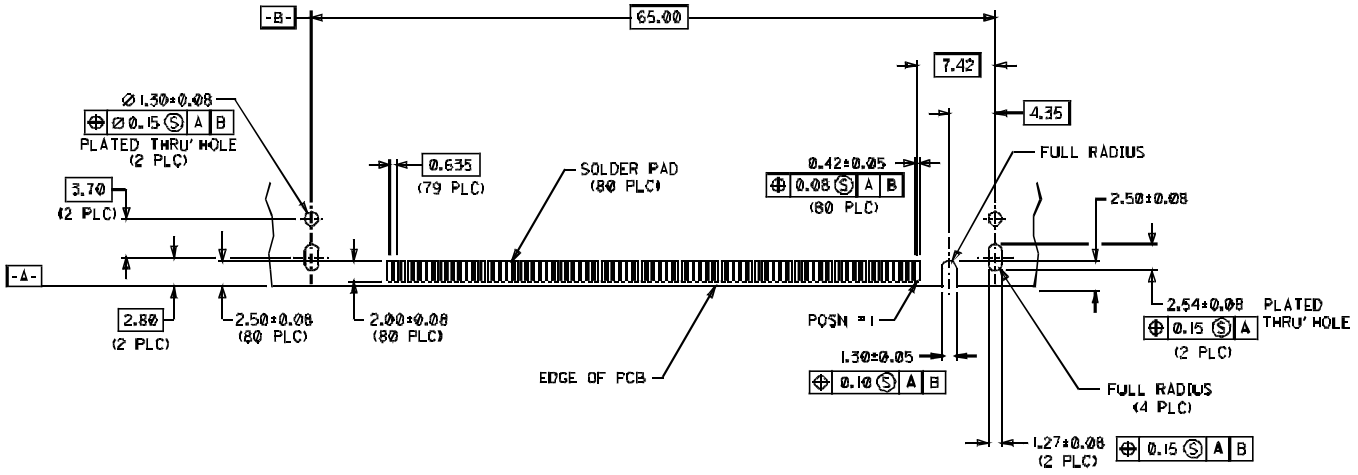


Figure 43 - Free board right angle 1-row surface mount (version 2)

NOTE: ONLY 80 POSITION SPECIFIED

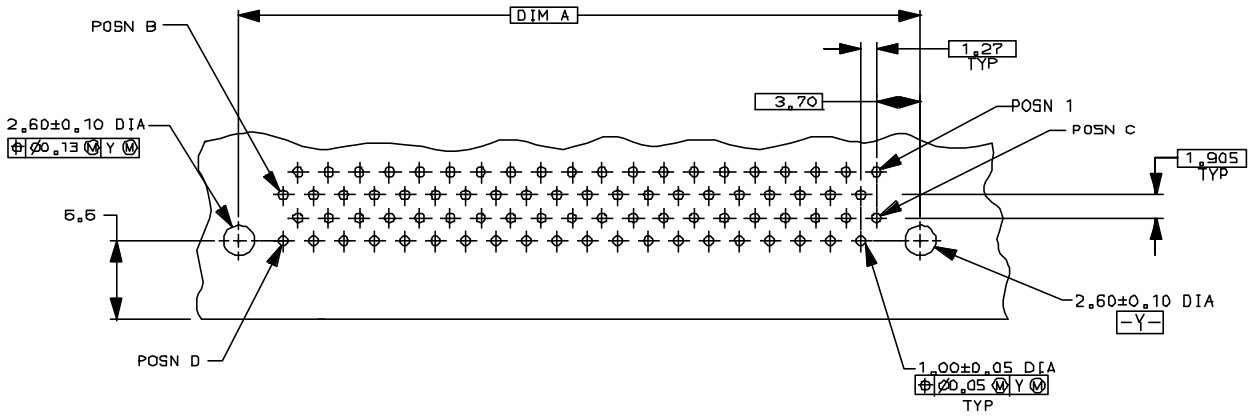


Figure 44 - Free board right angle 4-row through hole

Version	A	Position B	Position C	Position D
40	31.53	20	21	40
80	56.93	40	41	80

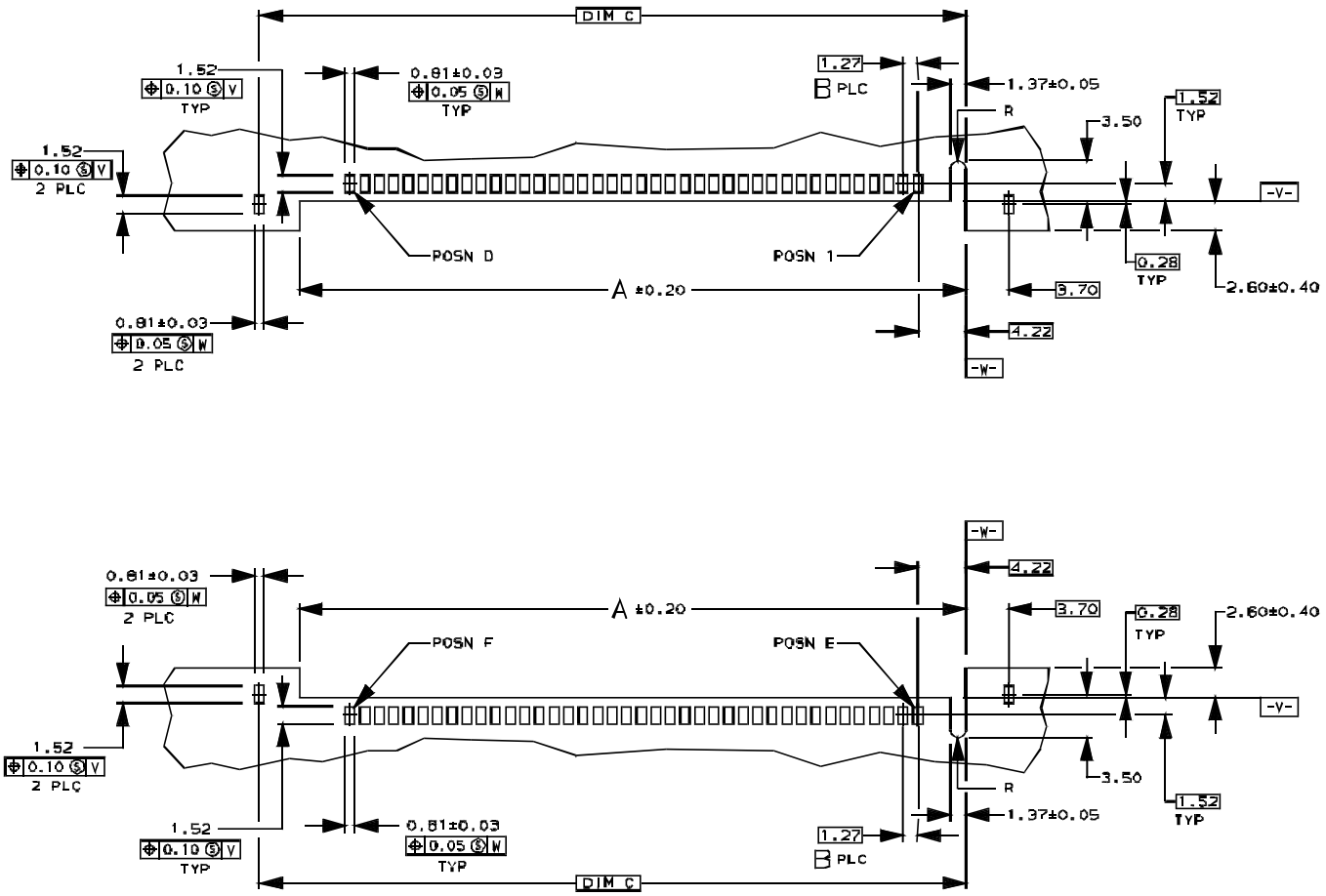


Figure 45 - Free board straddle mount

Version	A	B	DIM C	position D	position E	Position F
40 position	32.77	19	36.27	20	21	40
80 position	58.17	39	61.67	40	41	80

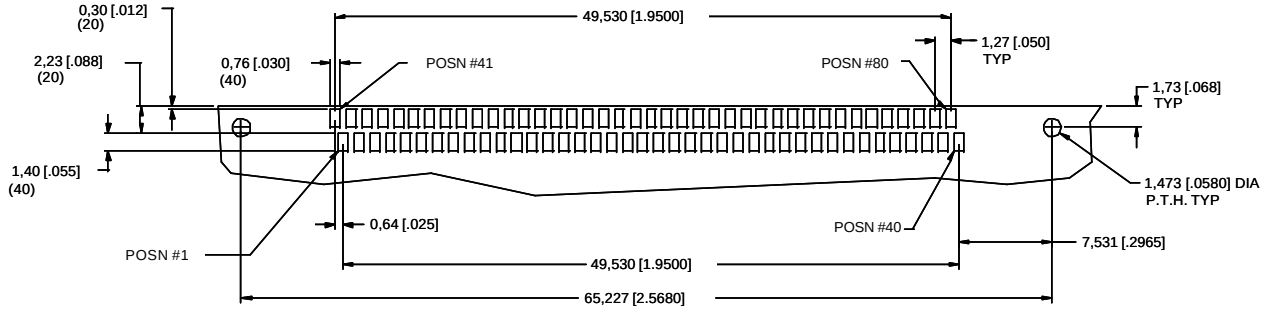


Figure 46 - Free board right angle 2-row surface mount

NOTE: ONLY 80 POSITION SPECIFIED

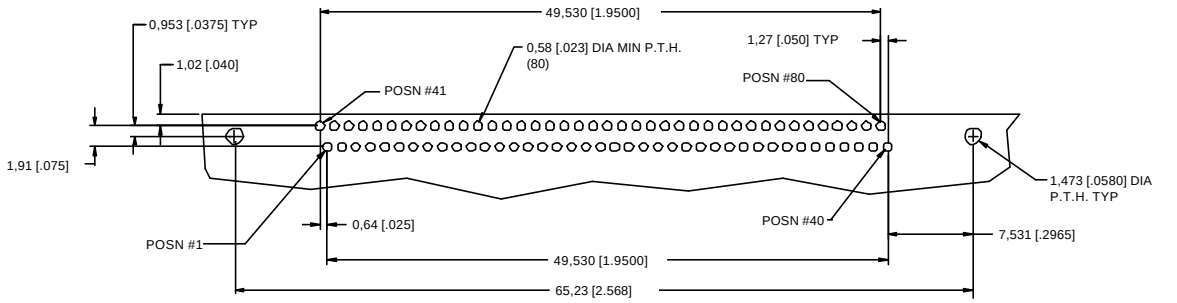


Figure 47 - Free board right angle 2-row through hole (version 1)

NOTE: ONLY 80 POSITION SPECIFIED

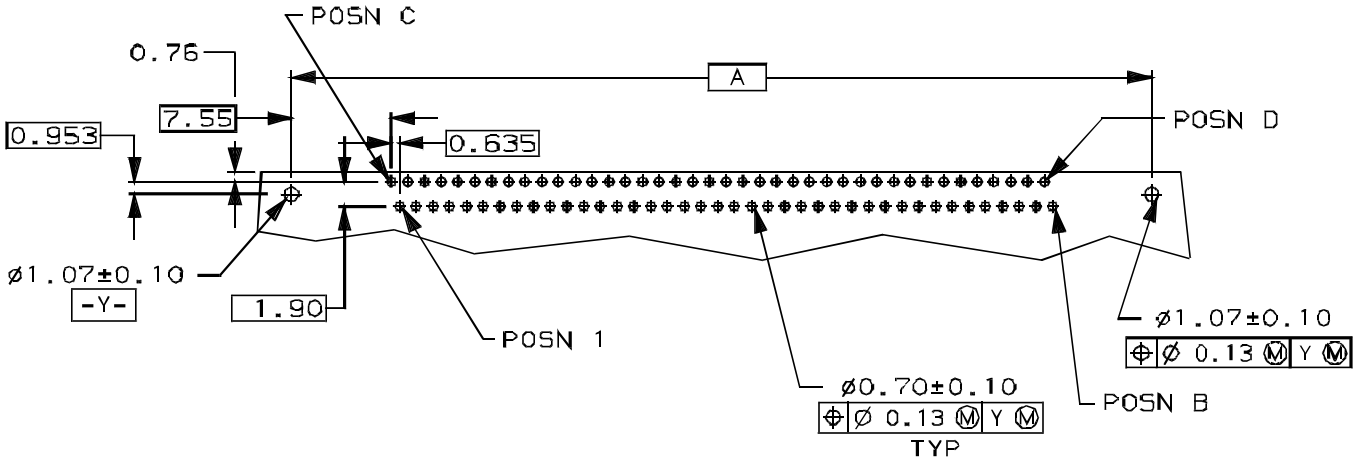


Figure 48 - Free board right angle 2-row through hole (version 2)

Version	A	Position B	Position C	Position D
40	39.83	20	21	40
80	65.23	40	41	80

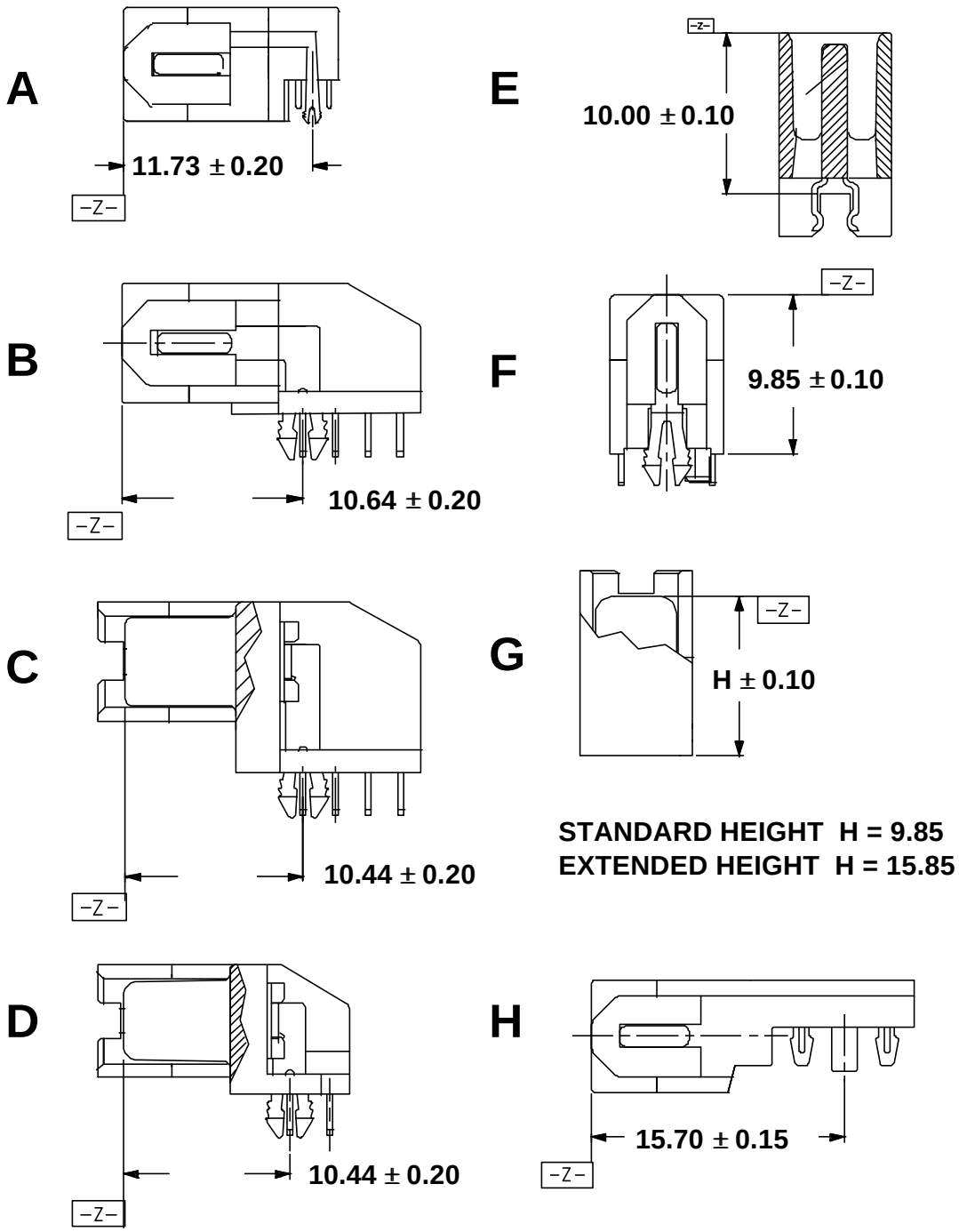


Figure 49 - Positioning requirements from board features

The requirements in Figure 49 apply as follows: A -- Figure 48, B -- Figure 44, C -- Figure 39, D -- Figure 40, E -- Figure 45, F -- Figure 41, G -- Figure 38, and H -- Figure 42.

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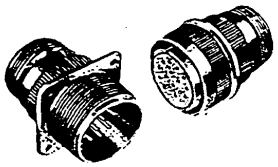
ANNEX A

EIA TERMINOLOGY FOR CONNECTOR GENDER

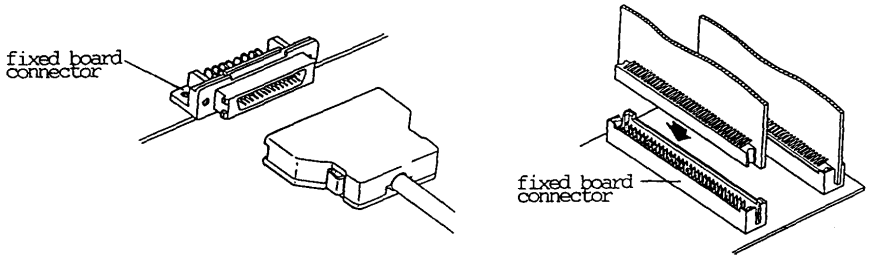
Figure 50 and Figure 51 describe the rationale for the EIA connector gender terminology.

(Expansion Connector)
A connector that provides a flexible connection between a rigid conductor and electrical apparatus.

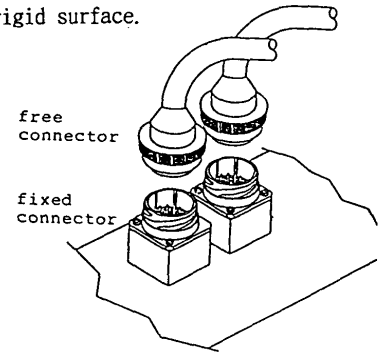
(Fireproof Connector) 581-06-09
A connector capable of withstanding flame of a specified temperature for a specified time.



(Fixed board Connector) 581-06-39
A connector mounted on removal printed board, for engagement with a Free Cable Connector or a Free Board Connector.



(Fixed Connector) 581-06-10
A connector for attachment to a rigid surface.



(Flat Cable Connector)
Connector designed specifically to terminate flat cable. May be designed for flat conductor, flat cable or round conductor flat cable.

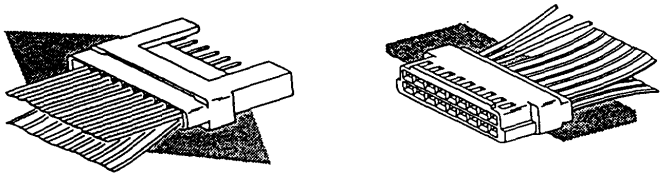
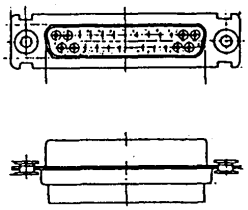
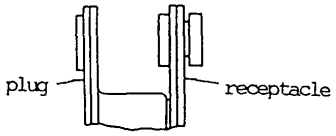


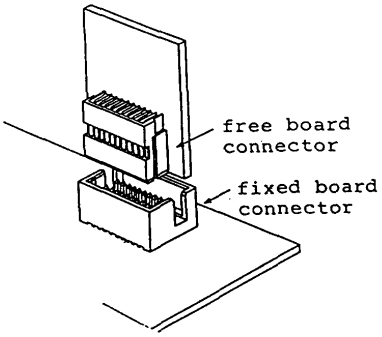
Figure 50 - EIA definitions for connector terminology

(Float Mounting Connector) 581-06-11
A fixed connector with mounting means permitting movement to facilitate align -ment with the mating connector.

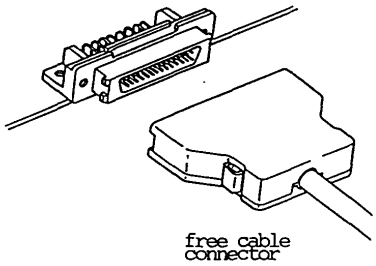




(Free Board Connector) 581-06-40
A connector mounted on a printed board which can be separated from Mother Board or Back Plane.

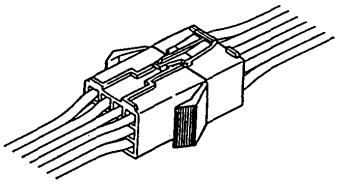


(Free Cable Connector) 581-06-12
A connector for attachment to the free end of a wire or cable.



(Free Coupler Connector) 581-06-13
A connector that mates with a Free Connector in a cable-to-cable appli -cation.

(Free Hanging Connector)
A connector that is movable and not fixed to a board, panel, or frame. It will mate another free-hanging connector or with a panel-mount connector.



(Hermaphroditic Connector) 581-06-14
A connector which mates with an identical connector.

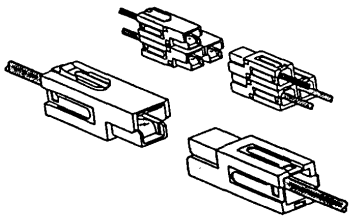


Figure 51 - EIA definitions for connector terminology