

SFF Committee

SFF-8087

Specification for

Mini Multilane 4X Unshielded Connector Shell and Plug

Standardized as EIA-975 at Rev 2.4 dated April 16, 2011

This specification was submitted as a project to become a standard, and was Expired at that time.

If there were modifications subsequent to the date of submittal, or any were made during the EIA approvals process, they may not be reflected in this copy.

EIA standards can be purchased from <http://global.ihs.com/>

CONTINUING ACTIVITY

Companion and subsequent specifications have been developed.

SFF-8086	Mini Multilane 10 Gb/s 4X Common Elements Connector
SFF-8088	Mini Multilane 4X Shielded Connector Shell and Plug
SFF-8642	Mini Multilane 10 Gb/s 12X Shielded Cage/Connector
SFF-8643	Mini Multilane 12 Gb/s 8/4X Unshielded Connector
SFF-8644	Mini Multilane 12 Gb/s 8/4X Shielded Cage/Connector
SFF-8645	Mini Multilane 24 Gb/s 8/4X Shielded Cage/Connector
SFF-8647	Mini Multilane 14 Gb/s 12X Shielded Cage/Connector
SFF-8648	Mini Multilane 28 Gb/s 12X Shielded Cage/Connector

SFF Committee documentation may be purchased in hard copy or electronic form.
SFF specifications are available at ftp://ftp.seagate.com/sff

SFF Committee

SFF-8087 Specification for

Mini Multilane 4X Unshielded Connector Shell and Plug

Rev 2.5

March 14, 2013

Secretariat: SFF Committee

Abstract: This specification defines the physical interface and general performance requirements for the Unshielded Mini Multilane connector. One such use is as the Serial Attached SCSI Mini SAS 4i (wide compact internal connector).

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

This specification 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 specification 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 specification is supported by the identified member companies of the SFF Committee.

POINTS OF CONTACT:

Jay Neer
Molex
2222 Wellington Court
Lisle, Il 60532

561-447-2907x3889
jay.neer@molex.com

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

408-867-6630
endlcom@acm.org

EXPRESSION OF SUPPORT BY MANUFACTURERS

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

Adaptec	Hitachi GST
AMCC	IBM
Amphenol	Intel
Comax	LSI
Dell	Molex
EMC	Seagate
ENDL	Sun Microsystems
FCI	Toshiba America
Fujitsu CPA	Tyco
Hewlett Packard	Unisys
Hitachi Cable	

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

Emulex	Picolight
Foxconn	Sumitomo
Infineon	Vitesse Semiconductor
Maxtor	

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. Members of the SFF Committee that advise that a patent exists are required to provide 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.

Update History:

Rev 2.3 (March 10, 2011)

- Rev 2.1 PDF with annotations was replaced by a Rev 2.3 DOC many months later
- Rev 2.2 had issues:
 - o Page 1 was identified as 2.2 but subsequent pages were identified as 2.1
 - o The date of 2.2 was the same as 2.1
- Updated Title to reflect changes made to title structure in January 2011
- Updated boilerplate to current content

Rev 2.4 (April 16, 2011)

- Editorial revision to incorporate 2011 titling and review content for consistency prior to being submitted for EIA standardization.

Rev 2.5 (March 14, 2013)

- Letter ballot for EIA-975 distributed for approval
- EIA ballot drew the comment that SFF-8087 and SFF-8088 are shells, and have no speed or electrical characteristics. The title and affected text were changed to reflect this correction.

Foreword

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in August 1990 has included a mix of companies, which are leaders across the industry.

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 and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of the SFF Committee as an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced more problems than the physical form factors of disk drives. In November 1992, the charter was expanded 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.

Those companies, which have agreed to support a 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.

SFF Committee meetings are held during T10 weeks (see www.t10.org), and Specific Subject Working Groups are held at the convenience of the participants. Material presented at SFF Committee meetings becomes public domain, and there are no restrictions on the open mailing of material presented at committee meetings.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission).

If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:

www.sffcommittee.com/ie/join.html

The complete list of SFF Specifications, which have been completed or are currently being worked on by the SFF Committee can be found at:

<ftp://ftp.seagate.com/sff/SFF-8000.TXT>

If you wish to know more about the SFF Committee, the principles which guide the activities can be found at:

<ftp://ftp.seagate.com/sff/SFF-8032.TXT>

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

SFF Committee --

Mini Multilane 4X Unshielded Connector Shell and Plug

1. Scope

This specification defines the plug, guide/strain relief shell, and latching requirements for the Mini Multilane Unshielded Connector based upon the primary elements defined in SFF-8086.

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 and specifications are relevant to this Specification.

- T10/1601D SAS 1-1 (Serial Attached SCSI - 1.1)
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8086 Mini Multilane 10 Gb/s 4X Common Elements Connector

2.2 SFF Specifications

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on are listed in the specification at <ftp://ftp.seagate.com/sff/SFF-8000.TXT>

2.3 Sources

Those who join the SFF Committee as an Observer or Member receive electronic copies of the minutes and SFF specifications (<http://www.sffcommittee.com/ie/join.html>).

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (<http://tinyurl.com/c4psg>).

TABLE OF CONTENTS

1.	Scope	5
2.	References	5
2.1	Industry Documents.....	5
2.2	SFF Specifications.....	5
2.3	Sources.....	5
3.	General Description.....	7
4.	Definitions and Conventions	7
4.1	Definitions.....	7
4.2	Conventions.....	7
5.	Connector Description.....	8
5.1	Performance Requirements.....	8
5.2	General View.....	8
5.3	Configurations.....	8
6.	Connector Dimensions	9
6.1	Free (Plug) Cable Connector.....	9
6.2	Fixed (Receptacle) Right Angle Connector.....	11
6.3	Keying (Optional).....	17

FIGURES

Figure 5-1	General View.....	8
Figure 6-1	Free (Plug) Cable Connector	10
Figure 6-2	Fixed (Receptacle) Right Angle Shell	11
Figure 6-3	Fixed (Receptacle) Right Angle Connector With Shell	12
Figure 6-4	Fixed (Receptacle) Right Angle Shell Footprint	13
Figure 6-5	Fixed (Receptacle) Straight Shell	14
Figure 6-6	Fixed (Receptacle) Straight Connector With Shell	15
Figure 6-7	Fixed (Receptacle) Straight Shell Footprint	16
Figure 6-8	Keying (Optional)	18

TABLES

Table 5-1	Configurations	8
Table 6-1	Free (Plug) Cable Connector	9
Table 6-2	Fixed (Receptacle) Right Angle Shell	11
Table 6-3	Fixed (Receptacle) Right Angle Connector with Shell	12
Table 6-4	Fixed (Receptacle) Right Angle Shell Footprint	13
Table 6-5	Fixed (Receptacle) Straight Shell	14
Table 6-6	Fixed (Receptacle) Straight Connector With Shell	15
Table 6-7	Fixed (Receptacle) Straight Shell Footprint	16
Table 6-8	Keying (Optional)	17

3. General Description

This specification defines the free (plug) cable connector, guide/strain relief, and latching requirements for the Unshielded Mini Multilane connector. This specification plus the mating interface and connector footprint defined in SFF-8086 defines the requirements to enable functional multiple sourcing.

The fixed (receptacle) connector provides positive retention along with ease of insertion and removal. The guide/strain relief is incorporated in the shell and works together with the free (plug) cable connector and latching mechanism to ensure that stress induced by normal cable routing and management is not passed through to the solder joints that attach the receptacle body to the printed circuit board.

The latch is designed to prevent the free (plug) cable connector from bottoming, and a hard stop has been defined to prevent bottoming out should the free (plug) cable connector be out of spec.

This specification defines the contact range that the retention scheme has to provide to assure acceptable connector performance.

The low profile and small size is well suited to high-speed transmission applications where space is limited.

4. Definitions and Conventions

4.1 Definitions

For the purpose of this specification, the definitions in SFF-8086 apply.

4.2 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.

English	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

5. Connector Description

5.1 Performance Requirements

The performance requirements of this connector are defined in SFF-8086 Mini Multilane 10 Gb/s 4X Common Elements Connector. For the free (plug) cable connector, the latch retention force shall be 10 lbf minimum.

5.2 General View

The connector system is based upon a common footprint for the receiving body. The footprint positioning holes contain the critical dimensions for locating the receptacle shell. The receptacle shell also functions as the guide and strain relief for the free (plug) cable connector interface. Figure 5-1 illustrates an example of one such configuration.

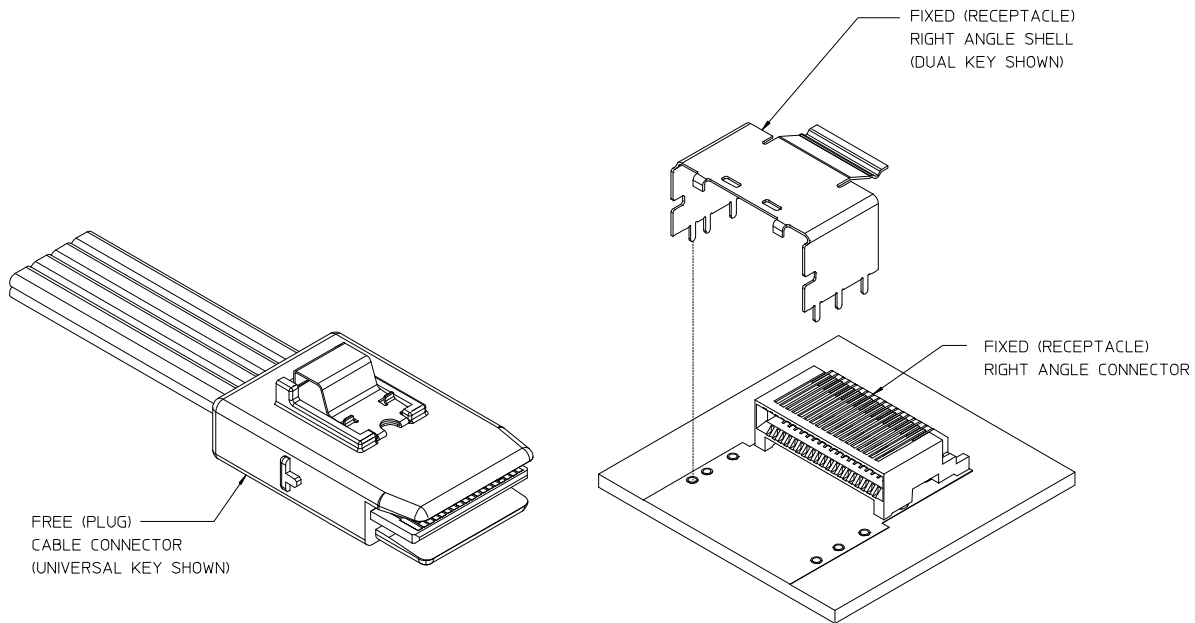


FIGURE 5-1 GENERAL VIEW

5.3 Configurations

Figure 5-1 lists the configurations described in this specification.

TABLE 5-1 CONFIGURATIONS

Description	Right Angle	Straight
26-circuit Unshielded Mini Multilane Connector	Y	Y
36-circuit Unshielded Mini Multilane Connector	Y	Y
50-circuit Unshielded Mini Multilane Connector	Y	Y
68-circuit Unshielded Mini Multilane Connector	Y	Y

Note: The 36-circuit Unshielded Mini Multilane Connector is defined in SAS as the "Mini SAS 4i" connector.

6. Connector Dimensions

The dimensioning conventions are described in ANSI-Y14.5M, Dimensioning and Tolerancing. All dimensions are in millimeters.

Dimension related requirements for the connector system addressed in this document are specified in the tables and figures in this clause.

6.1 Free (Plug) Cable Connector

TABLE 6-1 FREE (PLUG) CABLE CONNECTOR

Designator	Description	26	36	50	68	Tolerance
C01	Interface Width	11.60	15.60	21.20	28.40	±0.10
C03	Paddle Card Thickness	1.00	=	=	=	±0.10
D01	Plug Lower Shroud Width	10.33	14.33	19.93	27.13	±0.13
D02	Latch Tab Height (When Free)	5.45	=	=	=	Minimum
D02	Latch Tab Height (When Tab is Pressed)	5.15	=	=	=	Maximum
D03	Latch Body Width	9.00	=	=	=	±0.13
D04	Plug Key Surface	1.00	=	=	=	±0.05
D05	Plug Clearance to Connector	4.00	=	=	=	±0.10
D06	Plug Lead in to Connector	4.88	=	=	=	±0.15
D07	Plug Shroud Length	6.83	=	=	=	±0.10
D08	Plug Datum B to Latch Tab	1.80	=	=	=	±0.10
D09	Latch Tab Thickness	0.20	=	=	=	±0.05
D10	Anti-Rotation Rib Width	1.00	=	=	=	±0.05
D11	Plug Datum B to Shroud Start	10.13	=	=	=	±0.13
D12	Plug Shroud Length	1.83	=	=	=	±0.13
D13	Plug Datum A to Plug Stop	2.25	=	=	=	Minimum
D14	Plug Top Surface to Latch	3.90	=	=	=	Maximum
D15	Plug Stop Width	3.75	=	=	=	Minimum
D16	Plug Body Thickness	6.95	=	=	=	±0.10
D17	Plug Body Width	13.20	17.20	22.80	30.00	±0.10
D19	Plug Datum D to Latch Tab	3.30	=	=	=	±0.10
D20	Latch Tab Width	1.13	=	=	=	±0.10
D21	Plug Length	28.00	=	=	=	Minimum
D22	Plug Face	9.76	13.76	19.36	26.56	±0.13
D23	Plug Stop Height	0.60	=	=	=	Minimum
D24	Plug Lead in Angle	20°	=	=	=	±1°
D25	Datum B to Edge of Paddle Card	16.50	=	=	=	Basic
D26	Datum A to Shroud Lead-in	1.93	=	=	=	±0.10
D27	Datum A to Top of Plug	2.98	=	=	=	±0.05
D28	Lower Shroud Width	1.50	=	=	=	±0.10
D29	Datum B to End of Anti-Rotation Rib	1.50	=	=	=	±0.05
D30	Radius	1.00	=	=	=	±0.25
D31	Anti-Rotation Rib Lead-in (Chamfer or Radius)	0.25	=	=	=	±0.05

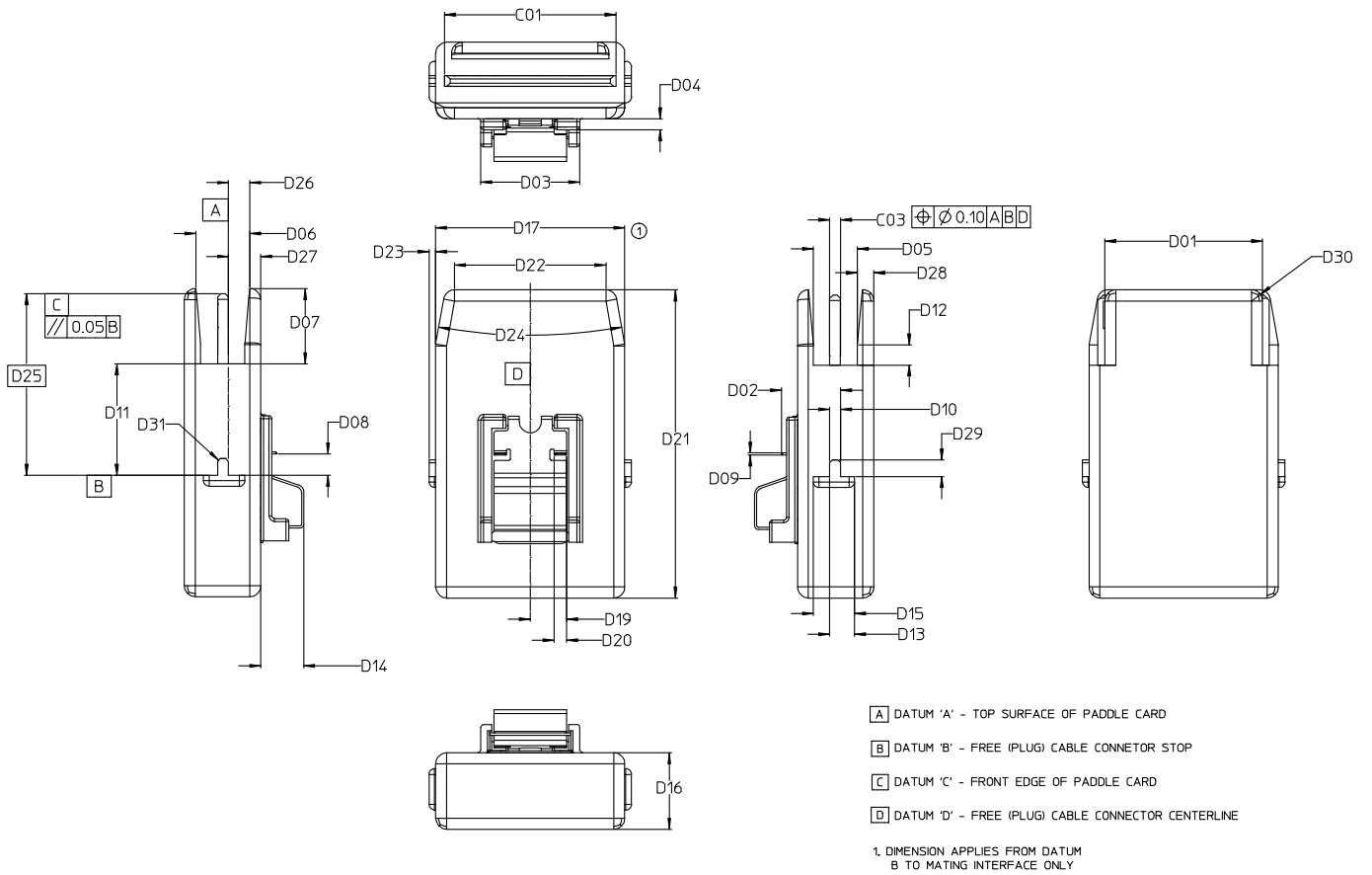
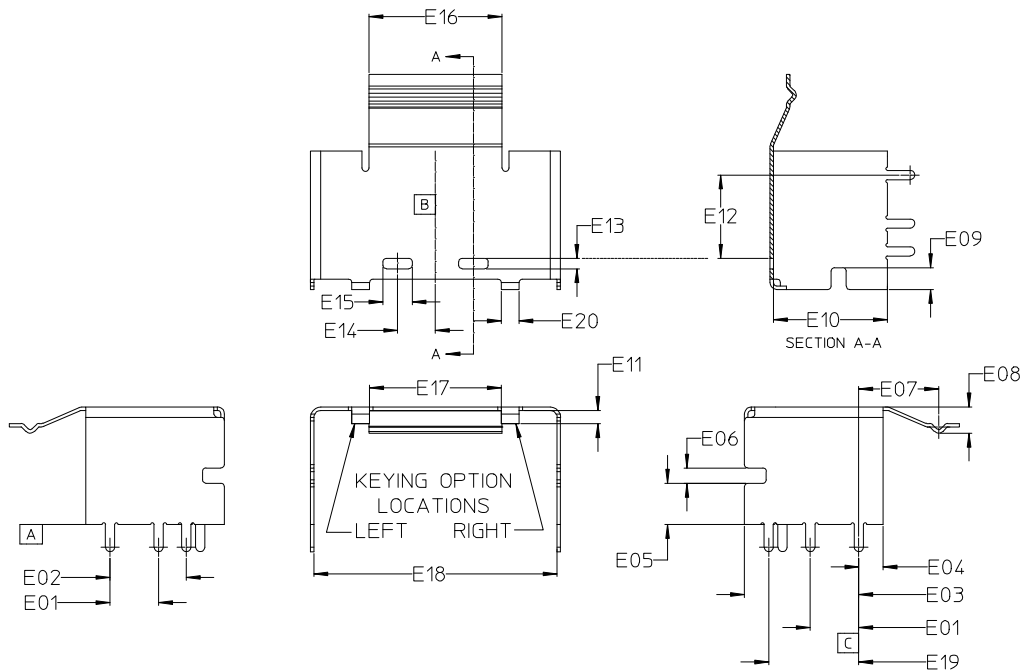


FIGURE 6-1 FREE (PLUG) CABLE CONNECTOR

6.2 Fixed (Receptacle) Right Angle Connector

TABLE 6-2 FIXED (RECEPTACLE) RIGHT ANGLE SHELL

Designator	Description	26	36	50	68	Tolerance
E01	Datum C to Peg	3.50	=	=	=	Basic
E02	Datum C to Peg	5.50	=	=	=	Basic
E03	Datum C to Plug Stop	8.25	=	=	=	Basic
E04	Datum C to Back of Shell	1.75	=	=	=	±0.13
E05	Datum A to Slot	2.97	=	=	=	±0.03
E06	Slot Width	1.10	=	=	=	±0.03
E07	Datum C to Passive Latch	5.76	=	=	=	±0.13
E08	Top of Shell to Passive Latch	1.89	=	=	=	±0.13
E09	Slot Depth	1.58	=	=	=	Basic
E10	Datum A to Shell Inside	8.22	=	=	=	±0.10
E11	Tab Length	0.95	=	=	=	±0.13
E12	Datum C to Latch Slot	6.00	=	=	=	Basic
E13	Latch Slot Width	0.75	=	=	=	±0.05
E14	Shell CL to Latch Slot CL	2.74	=	=	=	Basic
E15	Latch Slot Length	2.13	=	=	=	±0.05
E16	Passive Latch Width	9.60	=	=	=	±0.13
E17	Width between Keys	9.50	=	=	=	±0.10
E18	Width of Shell	13.55	17.55	23.15	30.35	±0.10
E19	Datum C to Peg	6.50	=	=	=	Basic
E20	Tab Width	1.28	=	=	=	±0.13



- [A] DATUM 'A' - FIXED (RECEPTACLE) RIGHT ANGLE SHELL LOWER EDGE
- [B] DATUM 'B' - FIXED (RECEPTACLE) RIGHT ANGLE SHELL CENTERLINE
- [C] DATUM 'C' - FIXED (RECEPTACLE) RIGHT ANGLE SHELL LOCATING PEG

FIGURE 6-2 FIXED (RECEPTACLE) RIGHT ANGLE SHELL

TABLE 6-3 FIXED (RECEPTACLE) RIGHT ANGLE CONNECTOR WITH SHELL

Designator	Description	26	36	50	68	Tolerance
A08	OAH Connector Housing	5.35	=	=	=	±0.13
F01	Overall Height of Shell	8.47	=	=	=	±0.13
F02	Shell Plug Stop to Connector	11.07	=	=	=	±0.10
F05	Connector to Edge of PCB	25.40	=	=	=	±0.13
F06	Shell to Edge of PCB	2.83	=	=	=	±0.13

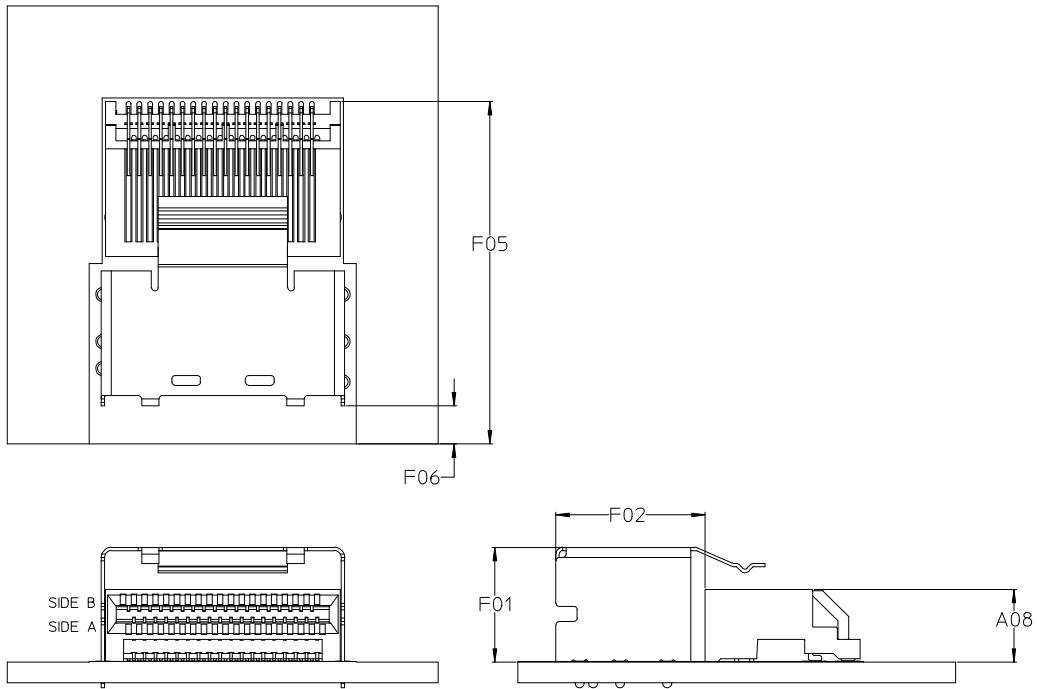
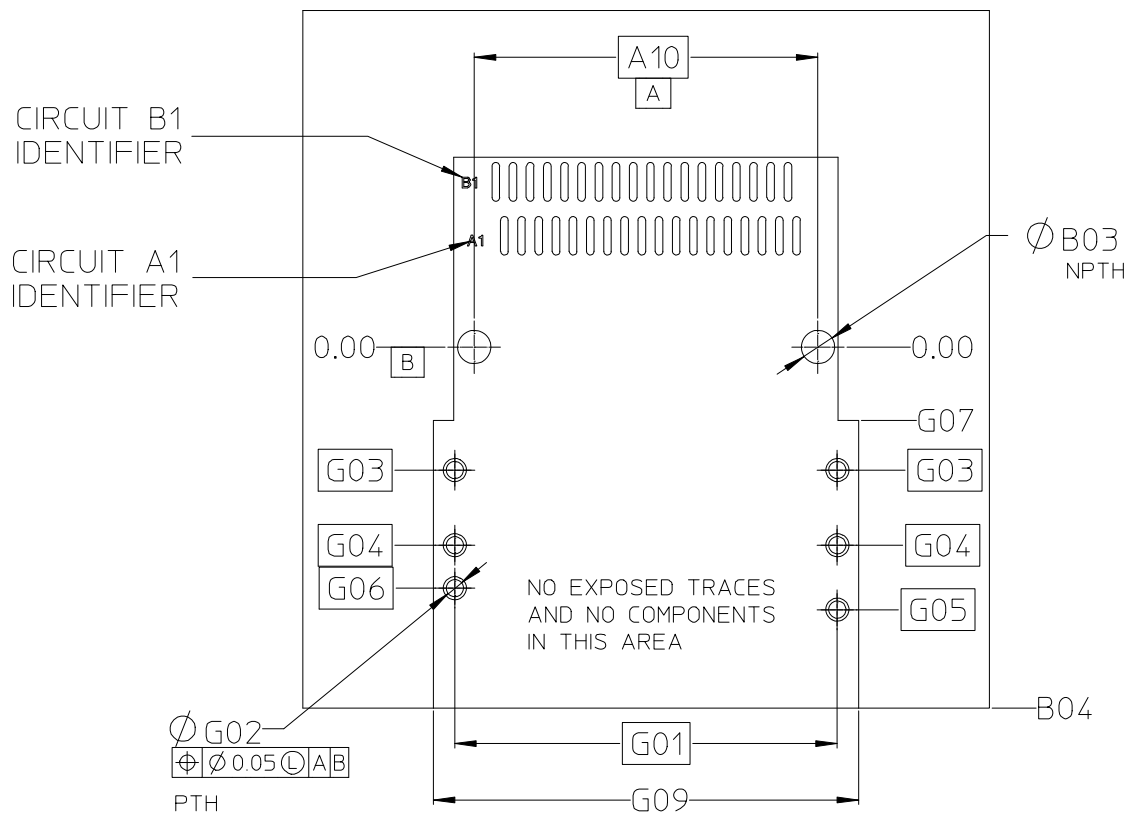


FIGURE 6-3 FIXED (RECEPTACLE) RIGHT ANGLE CONNECTOR WITH SHELL

TABLE 6-4 FIXED (RECEPTACLE) RIGHT ANGLE SHELL FOOTPRINT

Designator	Description	26	36	50	68	Tolerance
A10	Peg to Peg	12.00	16.00	21.60	28.80	Basic
B03	Hole Diameter	1.55	=	=	=	±0.05
B04	Peg CL to Edge of PCB	16.80	=	=	=	±0.13
G01	Shell Hole to Hole	13.80	17.80	23.40	30.60	Basic
G02	Hole Diameter	0.80	=	=	=	±0.05
G03	Datum B to Shell Hole	5.72	=	=	=	Basic
G04	Datum B to Shell Hole	9.22	=	=	=	Basic
G05	Datum B to Shell Hole	12.22	=	=	=	Basic
G06	Datum B to Shell Hole	11.22	=	=	=	Basic
G07	Datum B to Shell Keep Out	3.40	=	=	=	±0.13
G09	Shell Keep Out	15.80	19.80	25.40	32.60	±0.13

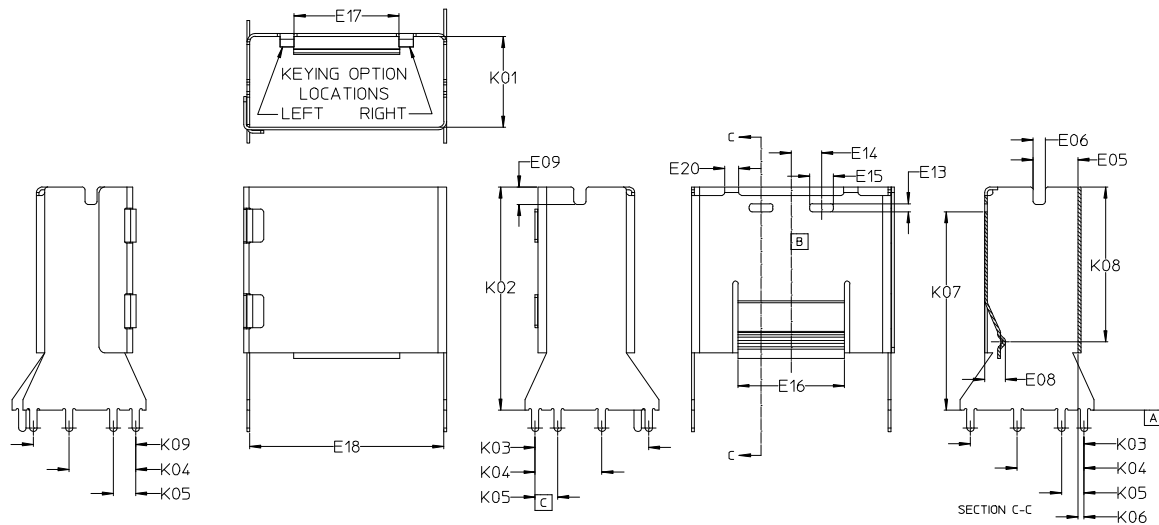


- [A] DATUM 'A' - CENTERLINE LOCATING PEG HOLES
- [B] DATUM 'B' - CONNECTOR LOCATING PEG HOLES

FIGURE 6-4 FIXED (RECEPTACLE) RIGHT ANGLE SHELL FOOTPRINT

TABLE 6-5 FIXED (RECEPTACLE) STRAIGHT SHELL

Designator	Description	26	36	50	68	Tolerance
E05	Inside of Shell to Slot	2.97	=	=	=	±0.03
E06	Slot Width	1.10	=	=	=	±0.03
E08	Top of Shell to Passive Latch	1.89	=	=	=	±0.13
E09	Slot Depth	1.58	=	=	=	Basic
E13	Latch Slot Width	0.75	=	=	=	±0.05
E14	Shell CL to Latch Slot CL	2.74	=	=	=	Basic
E15	Latch Slot Length	2.13	=	=	=	±0.05
E16	Passive Latch Width	9.60	=	=	=	±0.13
E17	Width Between Keys	9.50	=	=	=	±0.10
E18	Width of Shell	13.55	17.55	23.15	30.35	±0.10
E20	Tab Width	1.28	=	=	=	±0.13
K01	Inside Shell	8.22	=	=	=	±0.25
K02	Shell Height	20.18	=	=	=	±0.05
K03	Datum C to Peg	10.27	=	=	=	Basic
K04	Datum C to Peg	6.03	=	=	=	Basic
K05	Datum C to Peg	2.03	=	=	=	Basic
K06	Datum C to Peg	0.52	=	=	=	Basic
K07	Datum A to Latch Slot	17.93	=	=	=	Basic
K08	Plug Stop to Passive Latch	14.01	=	=	=	±0.13
K09	Datum C to Peg	9.27	=	=	=	Basic



- [A] DATUM 'A' - FIXED (RECEPTACLE) STRAIGHT SHELL LOWER EDGE
- [B] DATUM 'B' - FIXED (RECEPTACLE) STRAIGHT SHELL CENTERLINE
- [C] DATUM 'C' - FIXED (RECEPTACLE) STRAIGHT SHELL LOCATING PEG

FIGURE 6-5 FIXED (RECEPTACLE) STRAIGHT SHELL

TABLE 6-6 FIXED (RECEPTACLE) STRAIGHT CONNECTOR WITH SHELL

Designator	Description	26	36	50	68	Tolerance
K02	Shell Height	20.18	=	=	=	±0.05

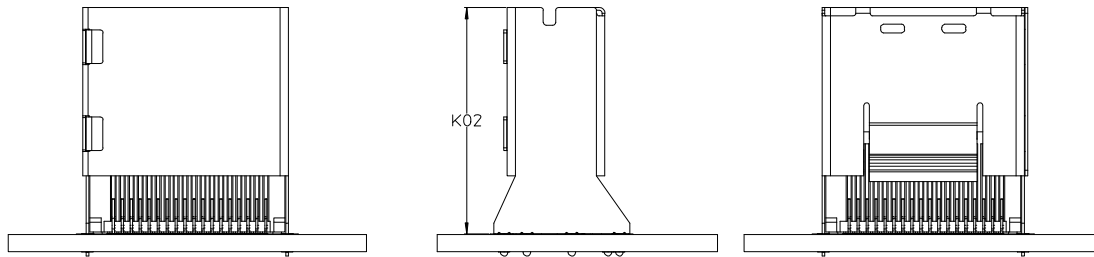
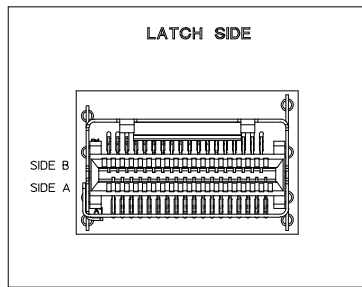
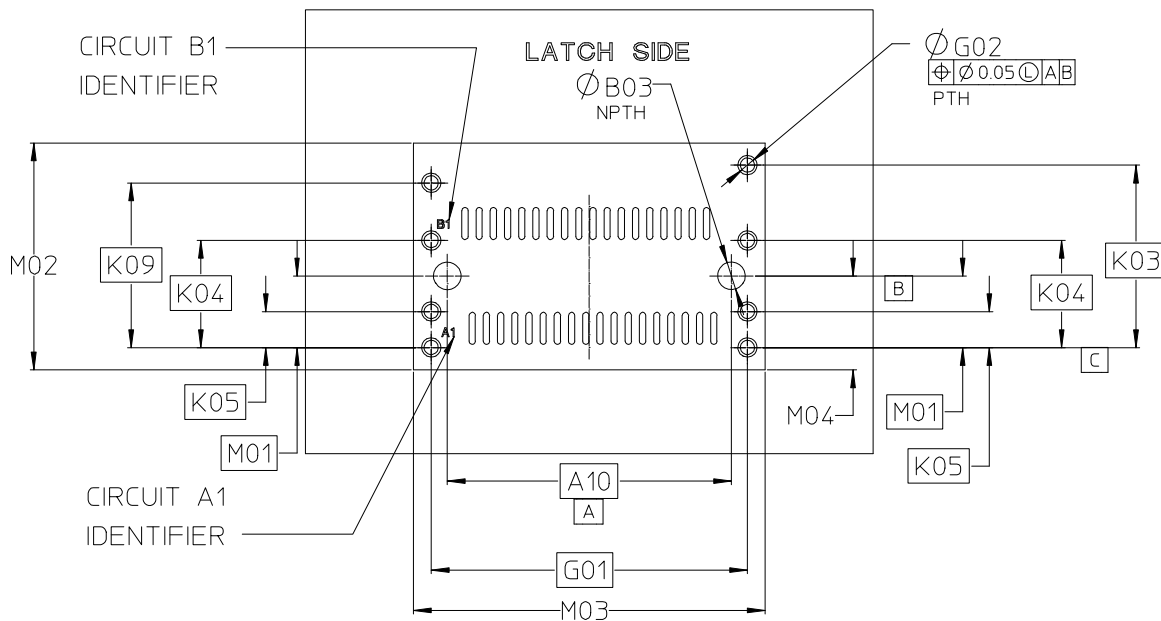


FIGURE 6-6 FIXED (RECEPTACLE) STRAIGHT CONNECTOR WITH SHELL

TABLE 6-7 FIXED (RECEPTACLE) STRAIGHT SHELL FOOTPRINT

Designator	Description	26	36	50	68	Tolerance
A10	Peg to Peg	12.00	16.00	21.60	28.80	Basic
B03	Hole Diameter	1.55	=	=	=	±0.05
G01	Shell Hole to Hole	13.80	17.80	23.40	30.60	Basic
G02	Hole Diameter	0.80	=	=	=	±0.05
K03	Datum C to Shell Hole	10.27	=	=	=	Basic
K04	Datum C to Shell Hole	6.03	=	=	=	Basic
K05	Datum C to Shell Hole	2.03	=	=	=	Basic
K09	Datum C to Shell Hole	9.27	=	=	=	Basic
M01	Datum B to Datum C	4.03	=	=	=	±0.13
M02	Connector Keep Out	12.77	=	=	=	±0.13
M03	Connector Keep Out	15.80	19.80	25.40	32.60	±0.13
M04	Datum B to Connector Keep Out	5.28	=	=	=	±0.13



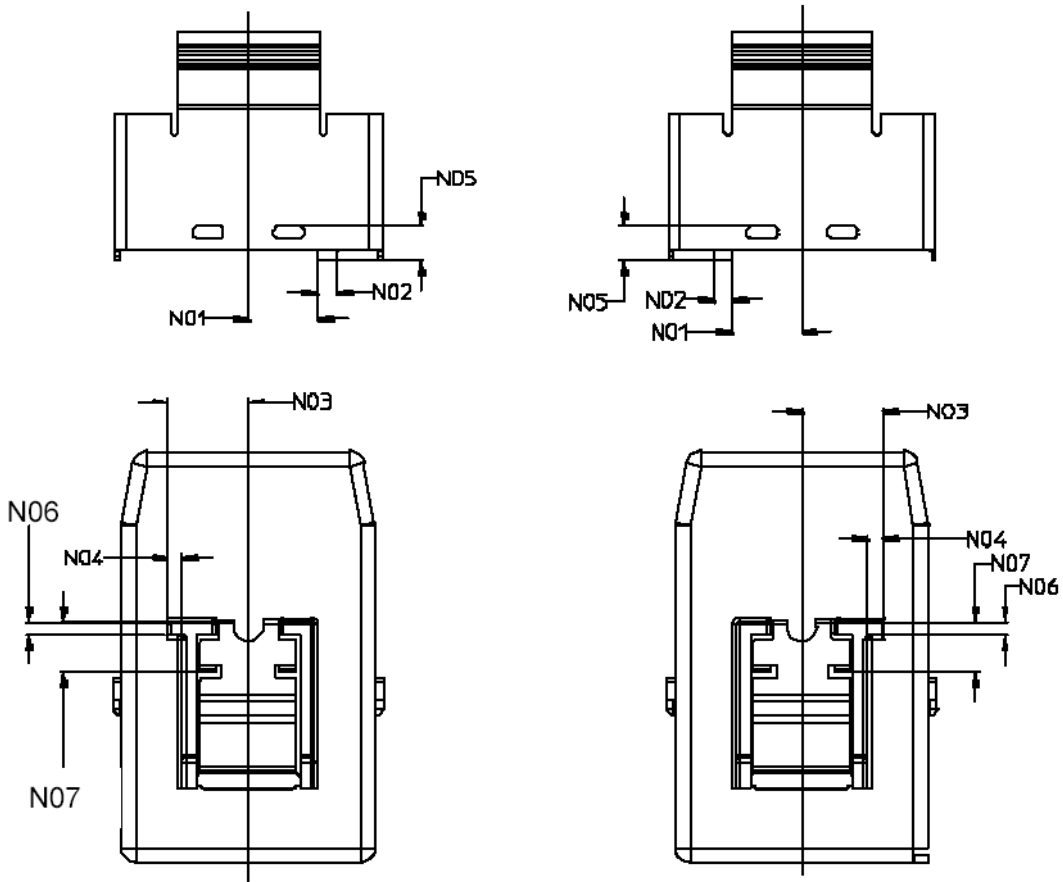
- [A] DATUM 'A' - CENTERLINE OF FIXED (RECEPTACLE) STRAIGHT CONNECTOR LOCATING PEG HOLES
- [B] DATUM 'B' - FIXED (RECEPTACLE) STRAIGHT CONNECTOR LOCATING PEG HOLES
- [C] DATUM 'C' - FIXED (RECEPTACLE) STRAIGHT SHELL LOCATING PEG HOLES

FIGURE 6-7 FIXED (RECEPTACLE) STRAIGHT SHELL FOOTPRINT

6.3 Keying (Optional)

TABLE 6-8 KEYING (OPTIONAL)

Designator	Description	26	36	50	68	Tolerance
N01	Shell CL to Edge of Key	4.75	=	=	=	±0.10
N02	Key Width	1.28	=	=	=	Minimum
N03	Plug CL to Edge of Key	5.50	=	=	=	±0.10
N04	Plug Key Width	1.00	=	=	=	Minimum
N05	Shell Slot to Key	2.25	=	=	=	±0.13
N06	Key Thickness	1.00	=	=	=	Minimum
N07	Latch to Key	3.45	=	=	=	±0.13

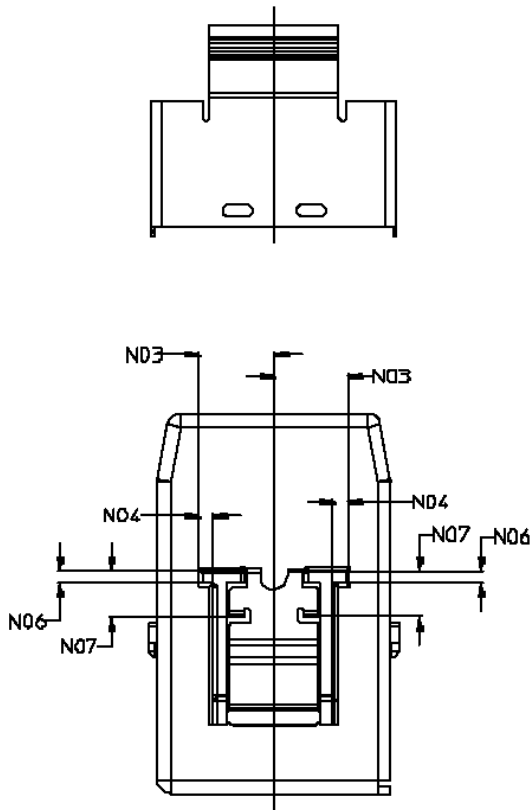


RIGHT KEY
(AS VIEWED TOWARDS
FIXED (RECEPTACLE) RIGHT ANGLE
BODY MATING INTERFACE)

Figure 6-8a

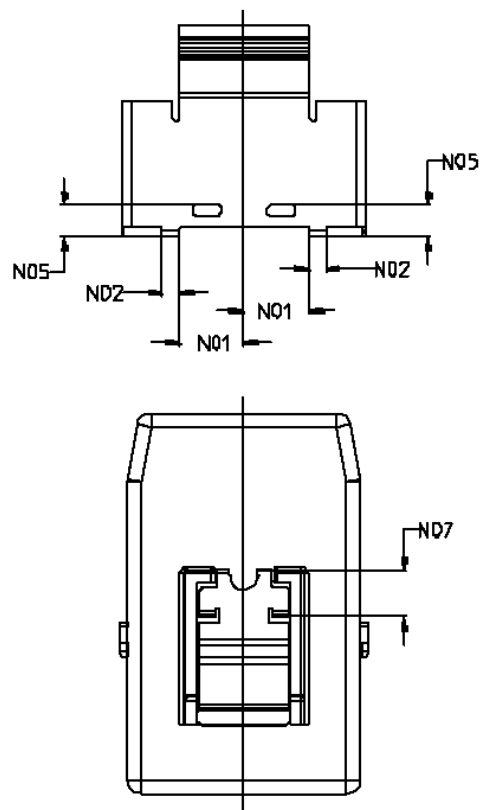
LEFT KEY
(AS VIEWED TOWARDS
FIXED (RECEPTACLE) RIGHT ANGLE
BODY MATING INTERFACE)

Figure 6-8b



UNIVERSAL KEY SHELL
DUAL KEY PLUG
(AS VIEWED TOWARDS
FIXED (RECEPTACLE) RIGHT ANGLE
BODY MATING INTERFACE)

Figure 6-8c



DUAL KEY SHELL
UNIVERSAL PLUG
(AS VIEWED TOWARDS
FIXED (RECEPTACLE) RIGHT ANGLE
BODY MATING INTERFACE)

Figure 6-8d (SAS Key - Ref)

FIGURE 6-8 KEYING (OPTIONAL)