

This document was developed by the SFF Committee prior to it becoming the SFF TA (Technology Affiliate) TWG (Technical Working Group) of the SNIA (Storage Networking Industry Association) in 2016.

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

POINTS OF CONTACT: SFF TA TWG Chair Email: sff-chair@snia.org.

LOCATION OF SFF DOCUMENTS: <http://www.snia.org/sff/specifications>.

Suggestions for improvement of this specification are welcome and should be submitted to <http://www.snia.org/feedback>.

If you are interested in participating in the activities of the SFF TA TWG, additional information and the membership application can be found at:

<http://www.snia.org/sff>.

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-8088 Specification for

Mini Multilane 4X Shielded Connector Shell and Plug

Rev 3.4

August 31, 2018

Secretariat: SFF Committee

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

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EXPRESSION OF SUPPORT BY MANUFACTURERS

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

3M	Hitachi Cable
Adaptec	Hitachi GST
AMCC	IBM
Amphenol	LSI
Comax	Molex
Dell	Seagate
EMC	Sun Microsystems
ENDL	Toshiba America
FCI	Tyco
Foxconn	Unisys
Hewlett Packard	Vitesse Semiconductor

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

Arista Networks	Maxtor
Cinch	Panasonic
Emulex	Picolight
ETRI	Pioneer NewMedia
Finisar	Sandisk/RAD
Fujitsu CPA	Sumitomo
Infineon	Volex
Intel	

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.

Updated History:

Rev 3.2 (April 16, 2011)

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

Rev 3.3 (March 14, 2013)

- 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.

Rev 3.4 (August 31, 2018)

- Document to be withdrawn from EIA; other than the changes to the header and cover page, no content or formatting changes have been made since Rev 3.3 of this document.

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 sign-up 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 Shielded Connector

1. Scope

This specification defines the plug, guide/strain relief shell, and latching requirements for the Mini Multilane Shielded connector based upon the mating interface 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>).

Copies of SFF, ASC T10 (SCSI), T11 (Fibre Channel) and T13 (ATA/SATA) standards and standards still in development are available on the HPE version of CD_Access (<http://tinyurl.com/85fts>).

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3. General Description

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

The 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 cable plug and latching mechanism to ensure that stress induced by normal cable routing and management is not passed through to the solder joints, which attach the receptacle body to the printed circuit board.

The latch is designed to prevent the plug from bottoming, and a hard stop has been defined to prevent bottoming out should the cable plug 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 for the contact mating interface for this connector system are defined in SFF-8086 Mini Multilane 10 Gb/s 4X Common Elements Connector. An additional performance requirement for the shielded versions is that the connector system with retention shall withstand 20 lbf minimum axial stress.

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) connector interface. Figure 5-1 illustrates an example of one such configuration.

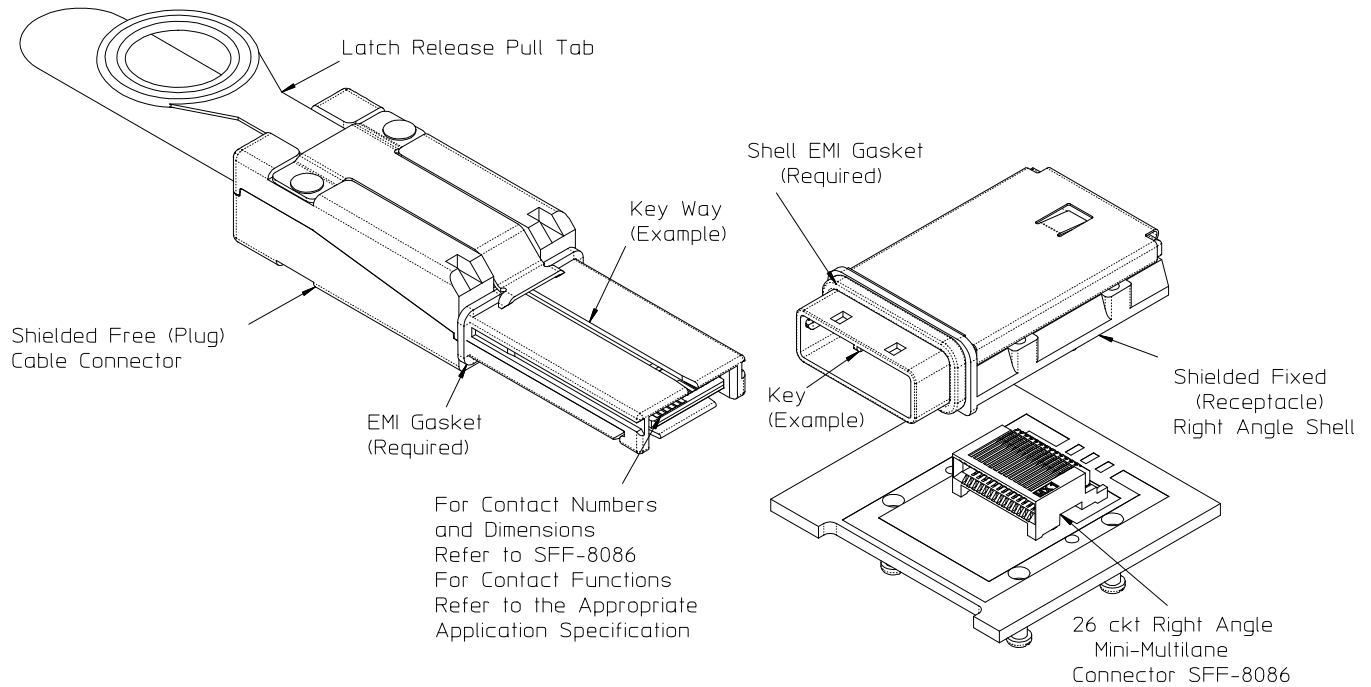


FIGURE 5-1 GENERAL VIEW OF SHROUDED VERSIONS

The fixed (receptacle) right angle shell comes in alternative versions, as seen in Figure 5-2.

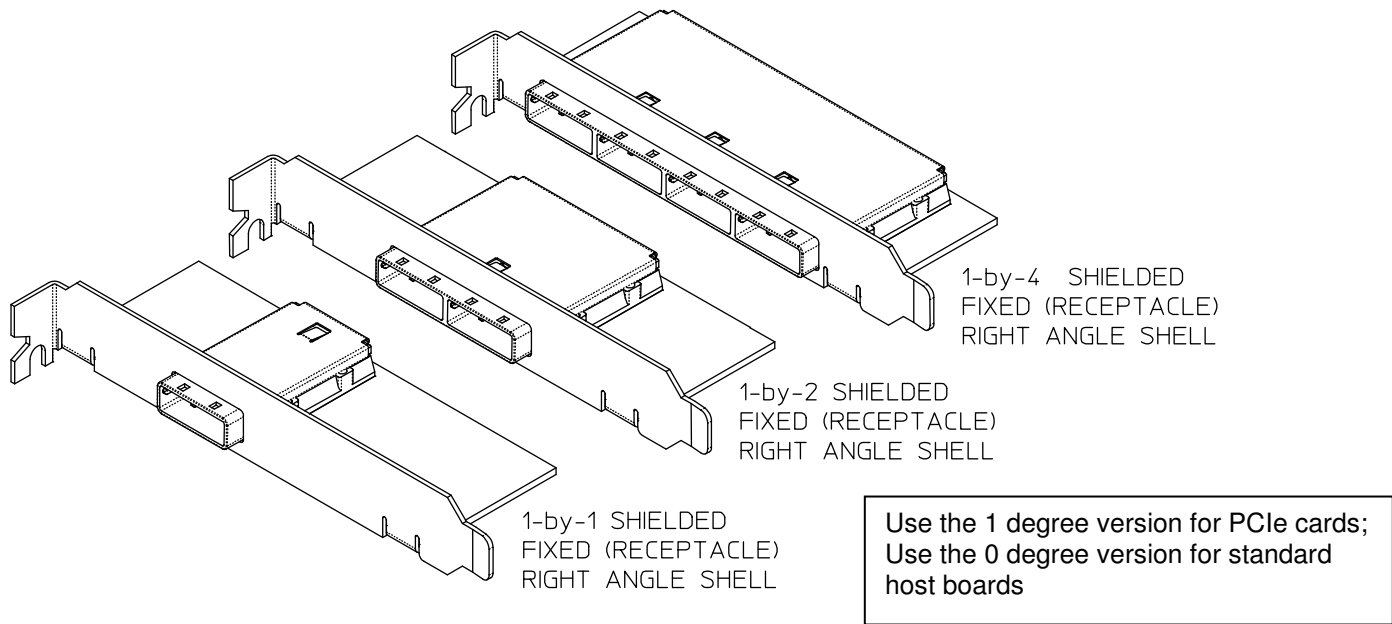


FIGURE 5-2 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL CONFIGURATIONS

5.3 Configurations

Table 5-1 lists the versions described in this specification.

TABLE 5-1 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL CONFIGURATIONS

Shielded Version	Orientation
1-by-1 Port 26-circuit Shielded Mini Multilane Connector	Right Angle
1-by-2 Port 26-circuit Shielded Mini Multilane Connector	Right Angle
1-by-4 Port 26-circuit Shielded Mini Multilane Connector	Right Angle

Note: There are no straight versions specified in this document. In addition, the 26-circuit Shielded Mini Multilane Connector is referred to in SAS as the "Mini SAS 4x" connector.

6. Dimensions

The dimensioning conventions are described in ANSI-Y14.5M, Geometric 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 Shielded Free (Plug) Cable Connector

TABLE 6-1 SHIELDED FREE (PLUG) CABLE CONNECTOR DIMENSIONS

Designator	Description	Dimension	Tolerance
E01	Plug Thickness	12.75	±0.13
E02	Rail Guide Way Length	27.04	±0.13
E03	Snout Bottom to Plug Top	10.55	±0.13
E04	Snout Thickness	5.54	+0.15/-0.05
E05	Clearance Groove Length	6.79	±0.13
E06	Snout Tip to Lower Tab Tip	0.75	±0.13
E07	Snout Internal Width	13.72	±0.10
E08	Lower Tab Forward Edge Width	8.88	±0.13
E09	Snout Tip to PCB Tip	0.42	±0.13
E10	Snout Length	28.31	±0.13
E11	Plug Width	18.70	±0.10
E12	Unused		
E13	Unused		
E14	PCB CL to Rail Guide Way Top	1.83	±0.13
E15	Rail Guide Way Width	1.25	±0.05
E17	Snout Top Surface Thickness/ Key Way Depth	0.70	±0.05
E18	Rail Guide Way Top to Snout Top	1.07	±0.05
E19	Rail Guide Way Top to Lower Tab Top	3.86	+0.15/-0.05
E20	Snout Width	17.14	+0.20/-0.05
E21	Rail Guide Way Root to Root - Zone A	15.64	±0.05
E21	Rail Guide Way Root to Root - Zone B	15.94	±0.05
E22	Zone B Length for E21	5.20	±0.13
E23	Zone A Length for E21	18.45	±0.13
E24	Chamfer Depth	0.30	±0.05
E25	Chamfer Length	1.00	±0.10
E26	Chamfer Depth	0.20	±0.05

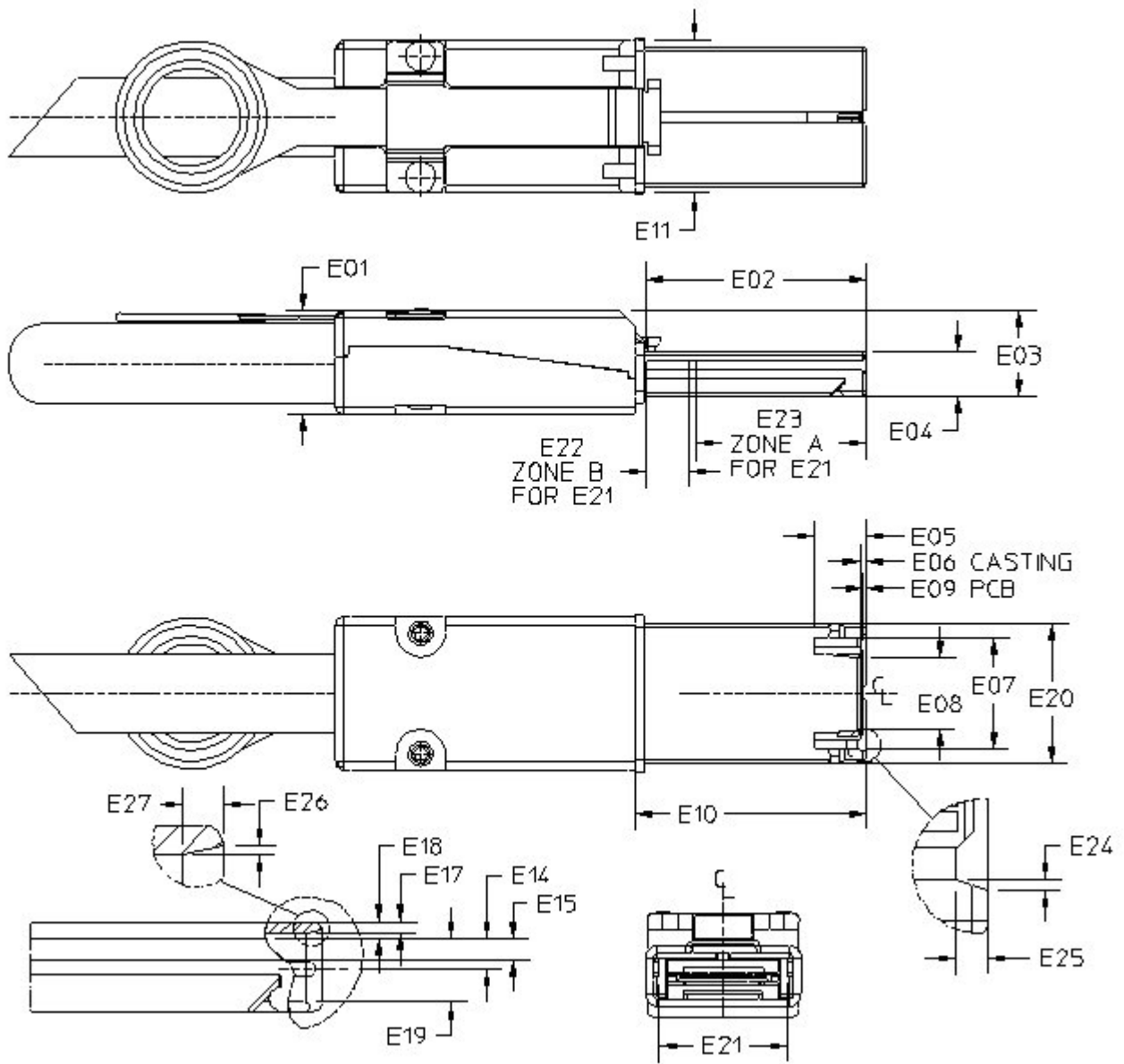


FIGURE 6-1 SHIELDED FREE (PLUG) CABLE CONNECTOR

TABLE 6-2 SHIELDED FREE (PLUG) CABLE CONNECTOR LATCH AND PULL TAB DIMENSIONS

Designator	Description	Dimension	Tolerance
F01	Latch to PCB	26.28	±0.20
F02	Width of Barbs	9.20	±0.10
F05	Latch Clearance	1.14	±0.10
F06	Latch Barb Length	1.50	±0.10
F07	Latch Barb Lead-in Height	1.14	±0.10
F08	Latch Barb Lead-in Angle	33.5°	±1.0°
F09	Latch to End of Pull	46.50	Minimum
F10	Unused	---	---
F11	Unused	---	---
F12	Unused	---	---
F13	Pull Width	18.80	Maximum
F14	Pull Thickness	0.75	Minimum
F15	Latch to Plug Body	1.60	±0.13

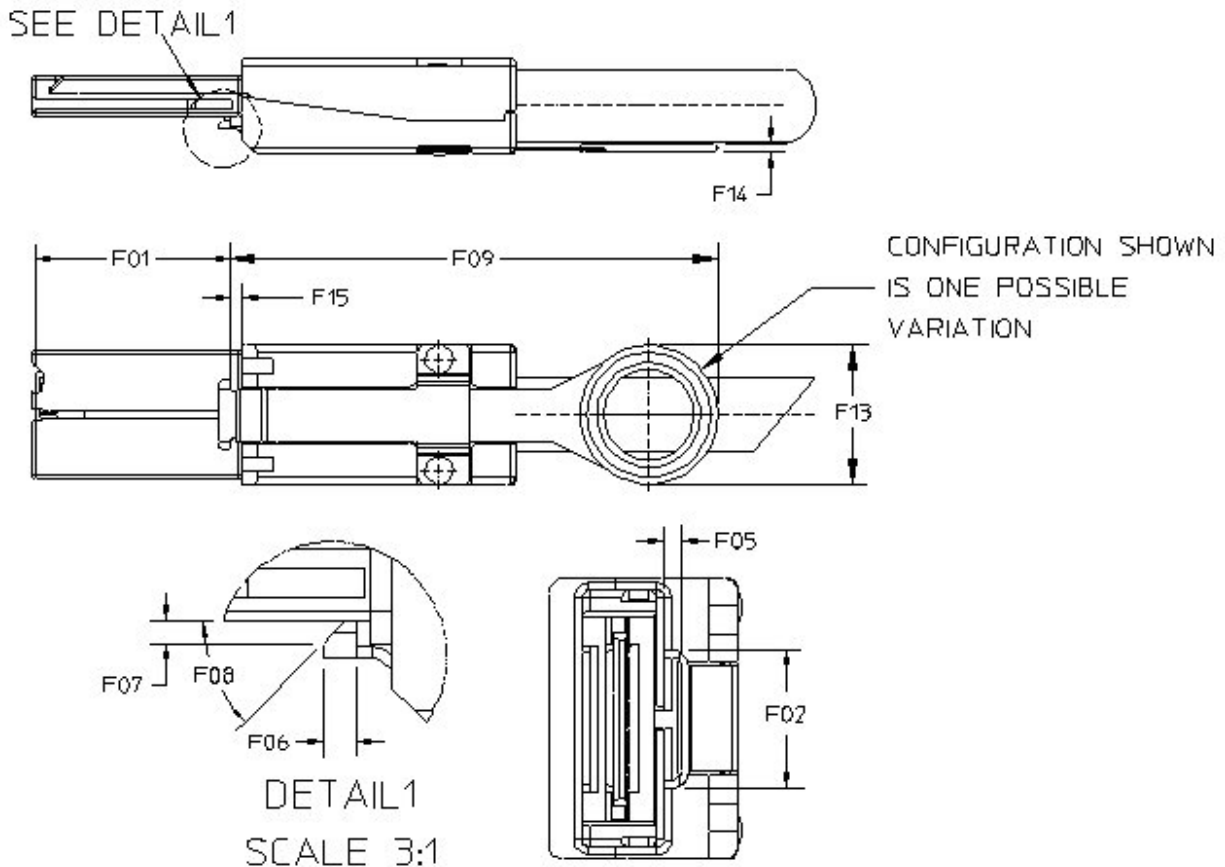
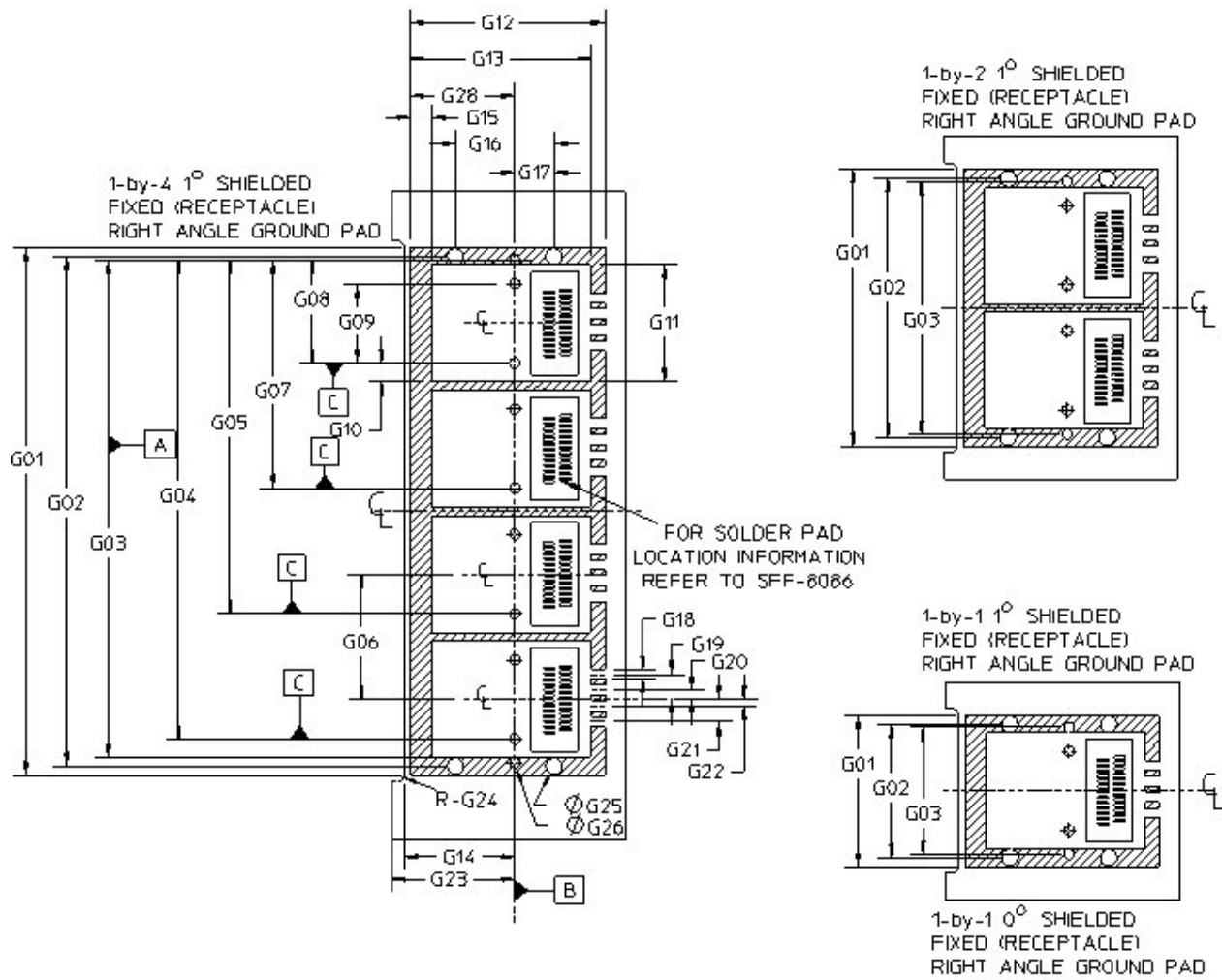


FIGURE 6-2 SHIELDED FREE (PLUG) CABLE CONNECTOR LATCH AND PULL TAB

6.2 Shielded Fixed (Receptacle) Right Angle Shell

TABLE 6-3 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE GROUND PAD DIMENSIONS

Designator	Description	1-by-4	1-by-2	1-by-1	Tolerance
G01	Ground Pad Width	80.00	41.97	22.96	±0.05
G02	Screw Hole Spacing	77.25	39.22	20.21	±0.05
G03	Alignment Hole Spacing	75.53	38.24	19.22	±0.05
G04	Ground Pad Datum to Port 4 Datum	72.65	N/A	N/A	±0.05
G05	Ground Pad Datum to Port 3 Datum	53.64	N/A	N/A	±0.05
G06	Port Spacing	19.01	=	=	Reference
G07	Ground Pad Datum to Port 2 Datum	34.63	=	N/A	±0.05
G08	Ground Pad Datum to Port 1 Datum	15.62	=	=	±0.05
G09	Connector Hole Spacing	12.00	=	=	±0.05
G10	Port Datum to Ground Pad	2.87	=	=	±0.05
G11	Port Mask Width	17.74	=	=	±0.05
G12	Ground Pad to Edge of PCB	29.48	=	=	±0.05
G13	Port Mask to Edge of PCB	27.37	=	=	±0.05
G14	Notch to Datum B	16.80	=	=	±0.05
G15	Pad Width	3.20	=	=	±0.13
G16	Screw Hole Spacing	15.00	=	=	±0.05
G17	Screw Hole to Datum	6.00	=	=	±0.05
G18	Trace Alley Width	1.50	=	=	±0.05
G19	Port CL to Trace Alley 1	3.80	=	=	±0.05
G20	Port CL to Trace Alley 2	1.40	=	=	±0.05
G21	Port CL to Trace Alley 4	3.40	=	=	±0.05
G22	Port CL to Trace Alley 3	1.00	=	=	±0.05
G23	Card Edge to Datum B	18.67	=	=	±0.13
G24	Fillet	1.00	=	=	Maximum
G25	Screw Hole Diameter	2.50	=	=	±0.05
G26	Locating Hole Diameter	1.55	=	=	±0.05
G27	Notch to Ground Pad Offset	1.00	=	=	Minimum
G28	Pad Edge to Datum B	15.80	=	=	±0.05



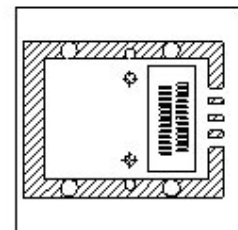
1° FOR USE WITH PCI CARD APPLICATIONS

ALL DIMENSIONS TYPICAL. REFER TO 1-by-4 FOR DETAILS

DATUM 'A' CENTERLINE LOCATING
PEG HOLES FOR SHIELDED
FIXED (RECEPTACLE)
RIGHT ANGLE SHELL

DATUM 'B' LOCATING PEG HOLES FOR
SHIELDED FIXED
(RECEPTACLE)
RIGHT ANGLE SHELL

DATUM 'C' REFERENCE DATUM FOR RA
MINI-MULTILANE CONNECTOR
SFF-8086 DATUM C



ALL 0° SHIELDED FIXED (RECEPTACLE)
RIGHT ANGLE GROUND PAD DIMENSIONS
ARE THE SAME AS 1° SHIELDED
FIXED (RECEPTACLE) RIGHT ANGLE
GROUND PAD DIMENSIONS EXCEPT
NO NOTCH IS REQUIRED IN PCB

THIS APPLIES TO 1-by-1, 1-by-2, AND 1-by-4

FIGURE 6-3 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE GROUND PAD

TABLE 6-4 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL DIMENSIONS

Designator	Description	1-by-4	1-by-2	1-by-1	Tolerance
H01	EMI Shield to Datum	24.96	=	=	Reference
H02	PCI Rail to Datum	19.71	=	=	±0.05
H03	Guide Rail Angle	1.0°	=	=	Reference
H04	Shield Locator Pin Diameter	1.46	=	=	±0.05
H05	Flange Height	8.95	=	=	±0.05
H06	EMI Shield to Datum	25.09	=	=	Reference
H07	Face Plate to Datum	19.71	=	=	±0.05
H08	EMI Gasket Gap Width	1.63	=	=	±0.50
H09	Gasket Mate Surface to Datum	18.09	=	=	±0.05
H10	Rear Height of EMI Shield	7.38	=	=	±0.05
H11	Flange Height	8.63	=	=	±0.05
H12	Guide Rail Set Back	1.00	=	=	±0.05
H13	Guide Rail to Opening Top	1.38	=	=	±0.05
H14	Guide Rail Thickness	1.00	=	=	±0.05
H15	Guide Rail to PCB	5.61	=	=	±0.05
H16	Guide Rail to PCB	5.19	=	=	±0.05
H17	Guide Rail Angle	0.0°	=	=	Reference
H18	Port Opening Height	5.84	=	=	±0.05
H19	EMI Shield Snout Height	7.29	=	=	±0.05
H20	Guide Rail Internal Spacing	16.14	=	=	±0.05
H21	Port Opening Width	17.74	=	=	±0.05
H22	Key Height	0.70	=	=	±0.05
H23	EMI Shield Snout Width	76.30	38.30	19.26	±0.05
H24	Datum to Port 1	9.63	=	=	±0.05
H25	Datum to Port 2	28.64	=	N/A	±0.05
H26	Datum to Port 3	47.65	N/A	N/A	±0.05
H27	Datum to Port 4	66.66	N/A	N/A	±0.05
H28	Latch Hole Spacing	8.70	=	=	±0.05
H29	Latch Hole Width	1.50	=	=	±0.05
H30	Latch Hole Length	2.00	=	=	±0.05
H31	Latch Hole Datum	24.09	=	=	±0.05
H32	Latch Hole to Snout Face	1.00	=	=	±0.05
H33	Guide Rail Height at Flange (1°)	7.42	=	=	±0.05
H34	Guide Rail Height at Rear (1°)	6.89	=	=	±0.05
H35	Datum to back edge (0° and 1°)	15.25	=	=	MAX

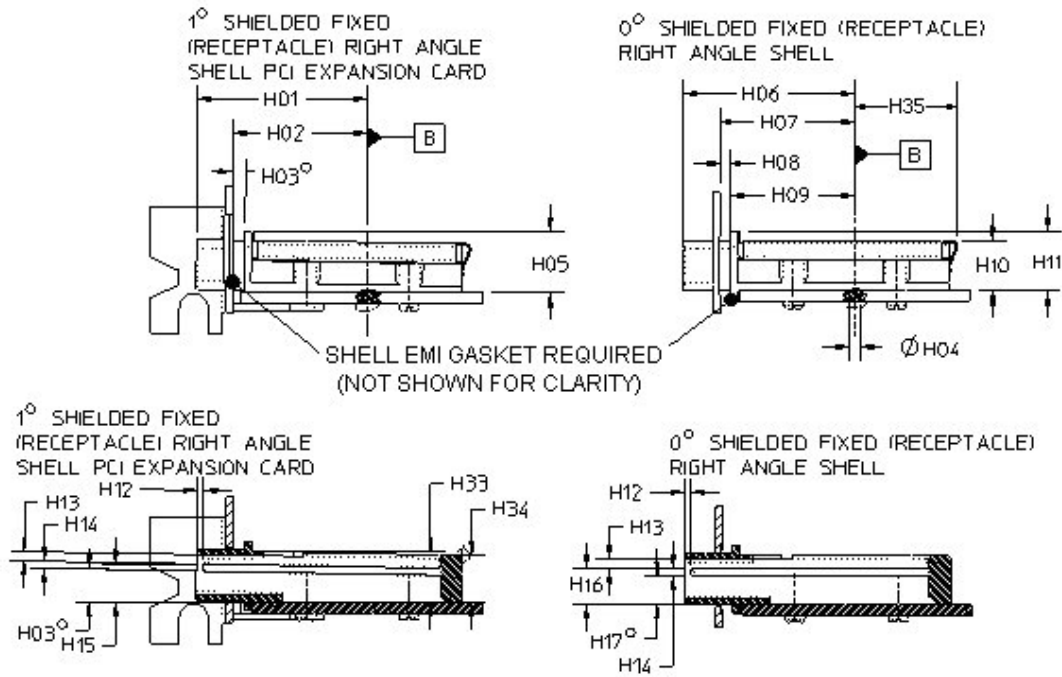
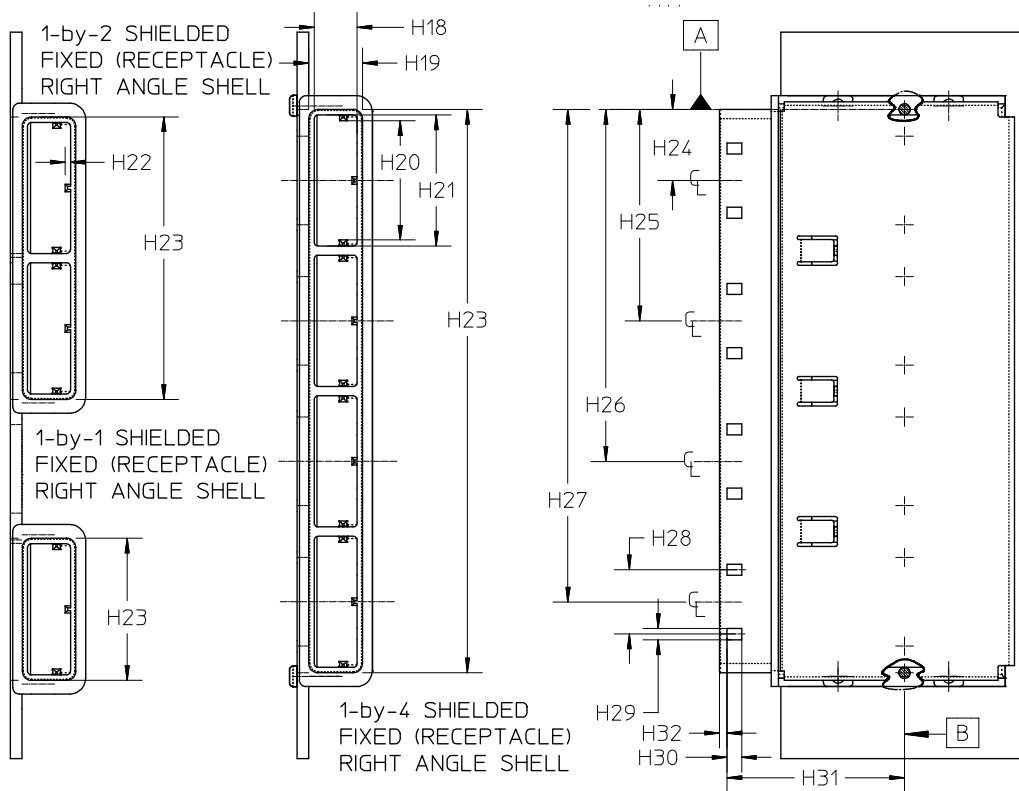


FIGURE 6-4 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL
 Standard Application - 0 Deg. PCI Card Application - 1 Deg.



ALL DIMENSIONS TYPICAL AND SYMMETRIC ABOUT PORT CENTER LINES

DATUM 'A' LOCATING PIN ON SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL

DATUM 'B' LOCATING PINS ON SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL

FIGURE 6-5 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE SHELL

TABLE 6-5 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE PANEL CUTOUT DIMENSIONS

Designator	Description	1-by-4	1-by-2	1-by-1	Tolerance
L01	Conductive Zone Length	79.79	41.76	22.74	±0.25
L02	Opening Length	76.79	38.76	19.74	±0.10
L03	Conductive Zone Width	10.50	=	=	±0.25
L04	Opening Width	7.70	=	=	±0.10
L05	Opening Corner Radius	1.00	=	=	Maximum
L06	Conductive Zone Corner Radius	2.00	=	=	Maximum
L07	Opening to PCB Offset 1° (above PCB)	0.33	=	=	+0/-0.20
L08	Opening to PCB Offset 0° (below PCB)	0.20	=	=	±0.10

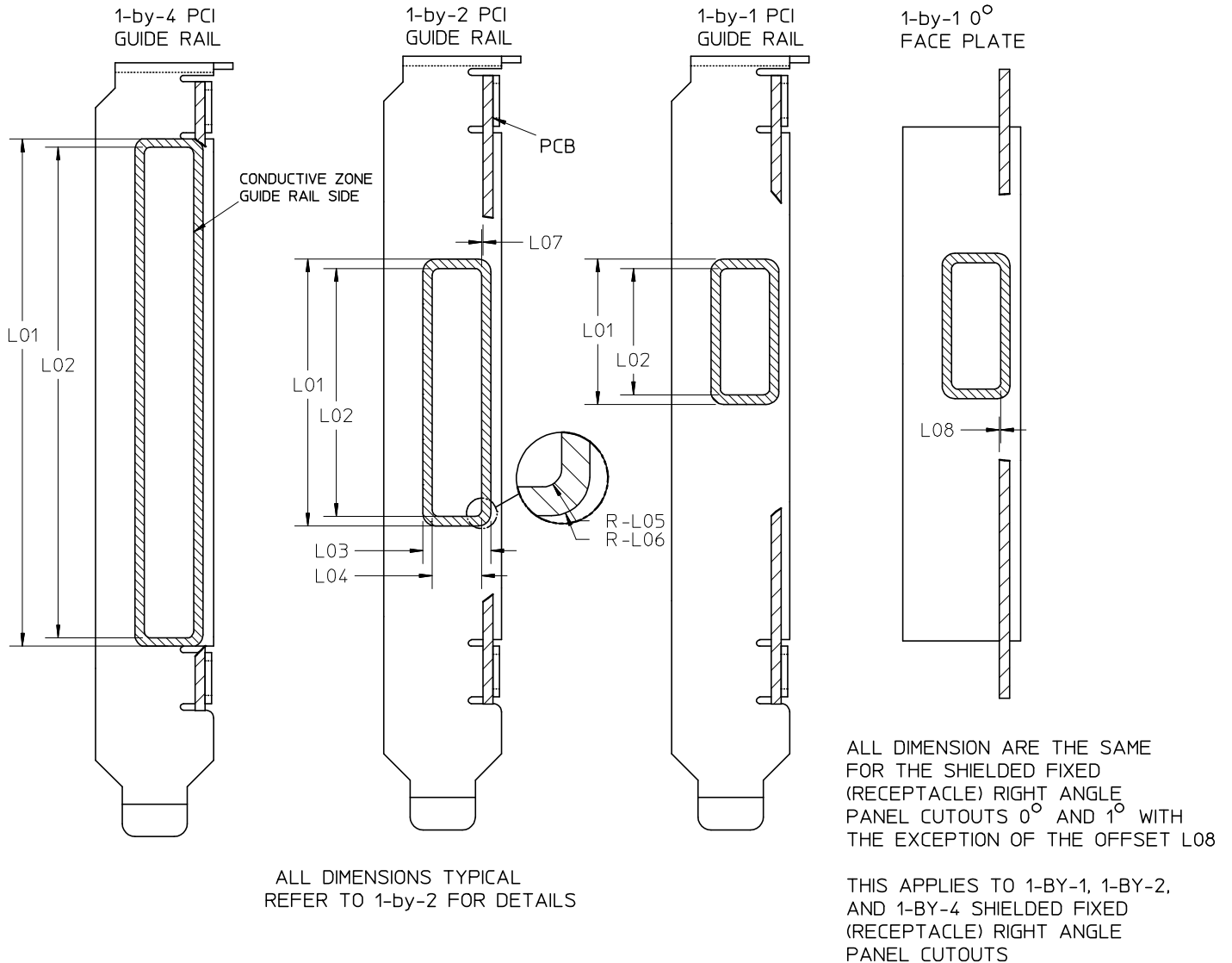


FIGURE 6-6 SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE PANEL CUTOUT

6.3 Shell Blocking Key (Optional)

The keying scheme is defined by the respective standard.

TABLE 6-6 SHELL BLOCKING KEY/KEYWAY DIMENSIONS (OPTIONAL)

Designator	Description	Dimension	Tolerance
K01	Plug CL to Key Way 1	6.00	±0.05
K02	Plug CL to Key Way 2	2.40	±0.05
K03	Plug CL to Key Way 3	1.20	±0.05
K04	Plug CL to Key Way 4	0.00	±0.05
K05	Plug CL to Key Way 5	1.20	±0.05
K06	Plug CL to Key Way 6	2.40	±0.05
K07	Plug CL to Key Way 7	6.00	±0.05
K08	Key Way Width	1.20	±0.05
K09	Key Way Lead-in Width	1.70	±0.05
K10	Key Way Lead-in Length	2.40	±0.05
J01	Port CL to Key 1	6.00	±0.05
J02	Port CL to Key 2	2.40	±0.05
J03	Port CL to Key 3	1.20	±0.05
J04	Port CL to Key 4	0.00	±0.05
J05	Port CL to Key 5	1.20	±0.05
J06	Port CL to Key 6	2.40	±0.05
J07	Port CL to Key 7	6.00	±0.05
J08	Key Width	1.00	±0.05

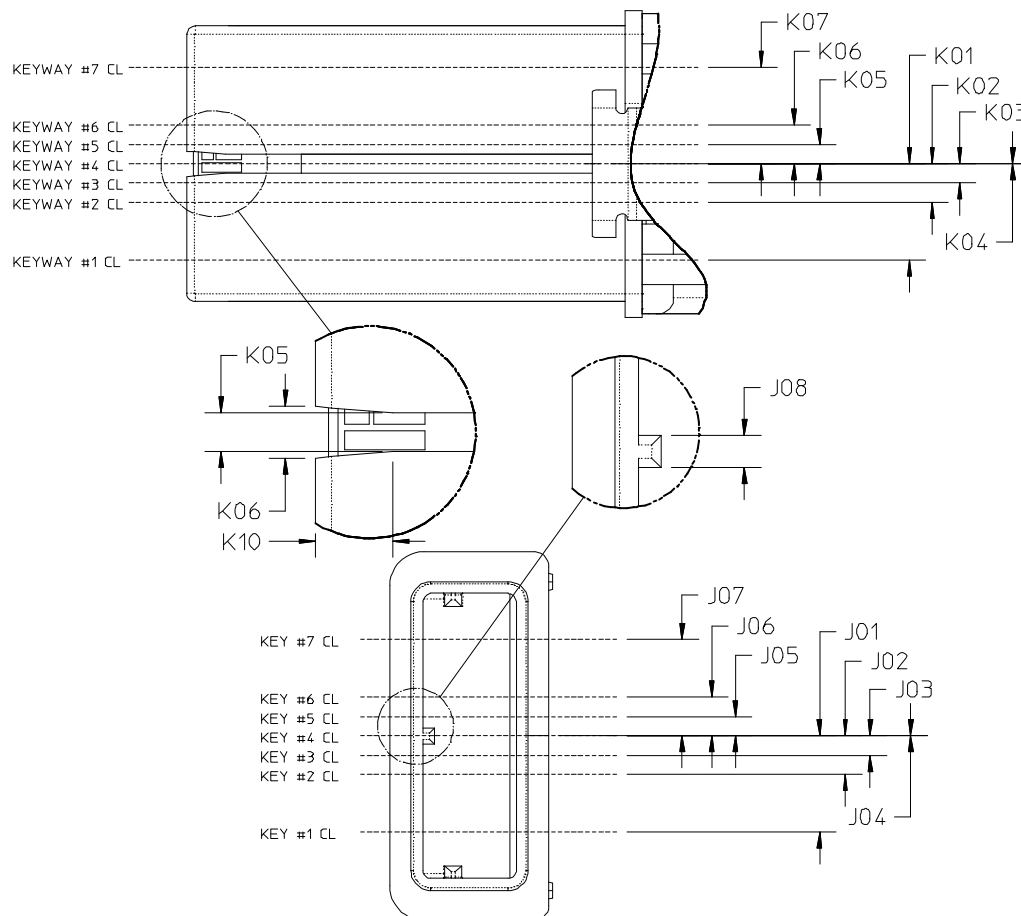


FIGURE 6-7 SHELL BLOCKING KEY DIMENSIONS

6.4 Plug Blocking Key (Optional)

The keying scheme is defined by the respective standard

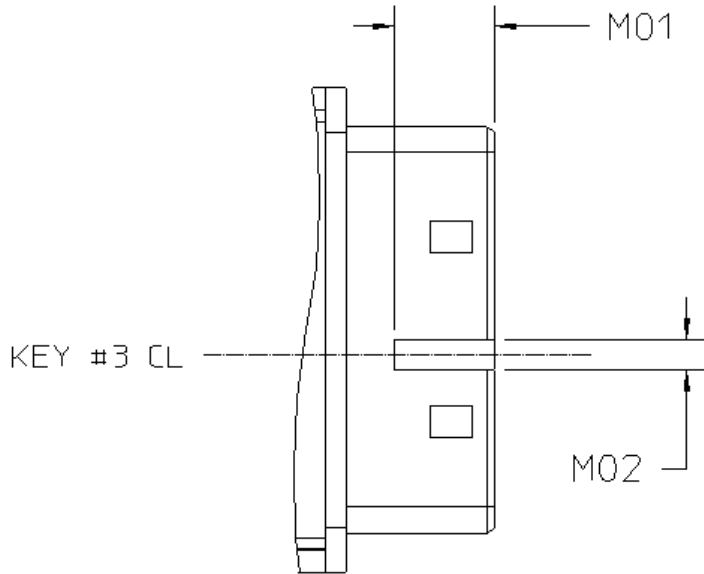


FIGURE 6-8 SHELL KEYWAY DIMENSIONS

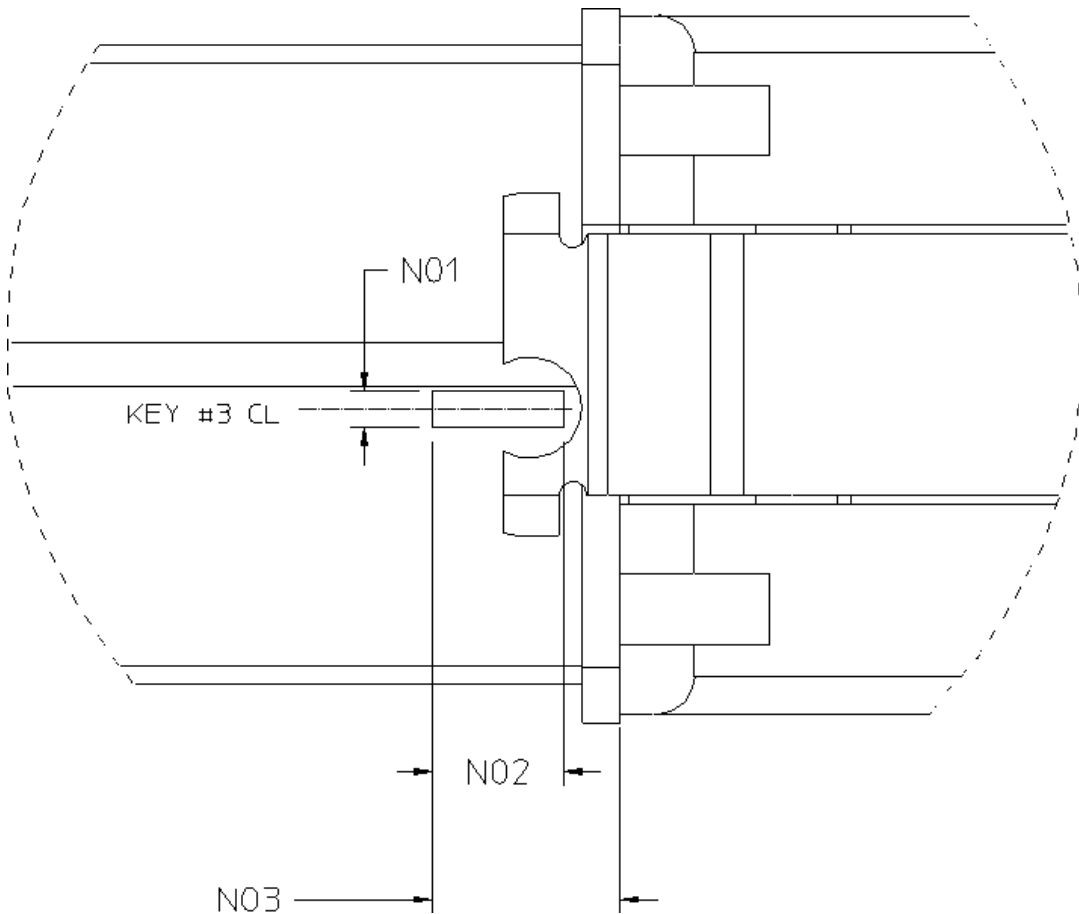


FIGURE 6-9 PLUG BLOCKING KEY DIMENSIONS - TOP VIEW

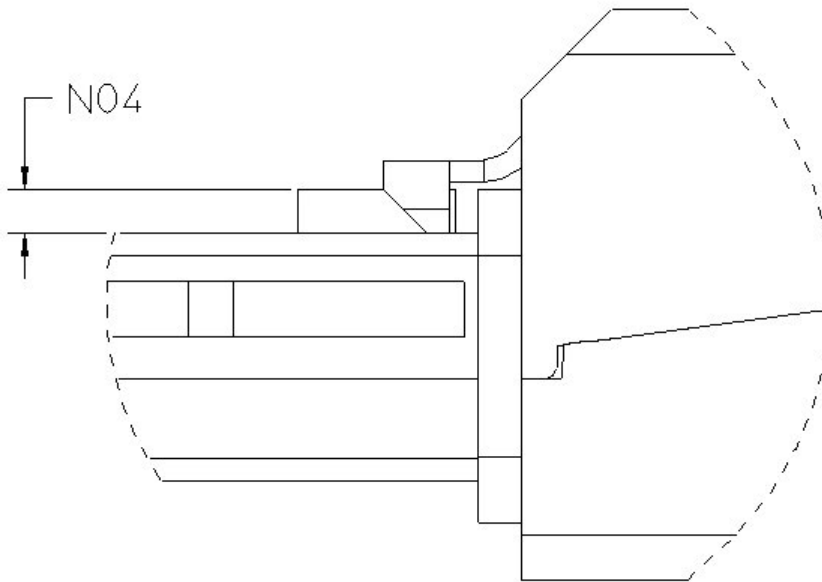


FIGURE 6-10 PLUG BLOCKING KEY DIMENSIONS - SIDE VIEW

TABLE 6-7 PLUG BLOCKING KEY DIMENSIONS

Designator	Description	Dimension	Tolerance
M01	Key Way Length	4.70	±0.05
M02	Key Way Width	1.36	±0.05
N01	Key Width	0.95	±0.05
N02	Key Length	3.50	±0.05
N03	Key End to Plug Body	5.00	±0.05
N04	Key Height	1.00	±0.05

6.5 Color Coding and Keying Definition

The pull tab color may be used to indicate the intended application for the interface of the cable assembly as defined by the respective application standards. Similarly, specific key arrangements are defined by the respective application standards.

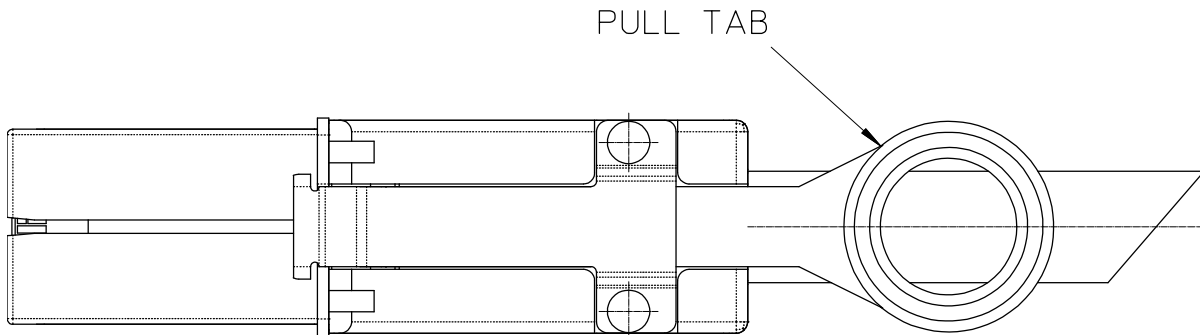


FIGURE 6-11 SHIELDED FREE (PLUG) CABLE CONNECTOR PULL TAB