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

SFF Committee

SFF-8613 Specification

for

Mini Multilane 8/4X Unshielded Connector

Rev 3.5 September 22, 2014

Secretariat: SFF Committee

Abstract: This specification defines the physical interface and general performance requirements for the Mini Multilane connector, which is designed for use in high speed serial, interconnect applications at multi-gigabit speeds. This connector is popularly referred to as the Mini-SAS HD (High Density) Connector system.

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 specification.

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.

All Best
Amphenol
Cinch
EMC
Emulex
FCI
Foxconn
Hewlett Packard
HGST
LSI
Luxshare-ICT
Luxtera
Molex
NetApp
NetLogic uSyst
Panduit
Shenzhen
TE Connectivity
Volex
Xyratex

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

Applied Micro
Avago
Broadcom
Dell Computer
Finisar
JDS Uniphase
Mellanox
MGE
Oclaro
Pioneer
QLogic
Sandisk
Seagate
Sumitomo
Toshiba
Western Digital

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, which 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.

Change History:

The content of this specification was formerly contained in SFF-8643, and it was broken out into a separate specification so that it could be referenced by higher speed variations.

Rev 2.1 November 5, 2010:
- Dimension designators changed to alpha order for Figures 6.2 through 6.8.

Rev 2.3 January 11, 2011
- Title changed to "Unshielded 8/4 Channel for 12 Gb/s Applications"
- Changed A11 from 0.105 +/- 0.025 to 0.10 +/- 0.05
- Added note to E01 to clarify contact zone
- Figure 6.8 and Table 6.8 - 1x4 removed

Rev 2.6 August 9, 2012
- Editorial revision to adopt latest template
- Removed electrical performance requirements specified by the using interface
- Simplified titling of sections, figures and tables
- Replaced double drawings of Figure 2-1
- Sections made consistent between SFF-8643 and SFF-8644

Revision 2.7 April 22, 2013
- Adopt editorial convention of Gb/s

Revision 2.8 June 3, 2013
- Added appropriate figures for the new vertical versions
- Dimensioned the keep-out areas in the connector footprints
- Added rib to top of the right angle latch area

Revision 2.9 July 10, 2013
- Expanded Figure 3-1 to include more configurations
- Redrew figures and clarified dimensioning on vertical configurations

Revision 3.0 July 27, 2013
- Corrected some dimensions in Tables 6-1, 6-2 and 6-4

Revision 3.1 August 22, 2013
- Updated dimensions in Tables 6-1, 6-2 and 6-4
- Added R(ight angle) and V(ertical) suffixes to Tables 6-1 and 6-2
- Added optional holes to Figures 6-10 and 6-12

Revision 3.2 February 26, 2014
- Revised description 3.0
- Updated Table 3-1 to list all versions
- Revised designators in Tables 6-1 and 6-2
- Removed revision note below Table 6-4
- Revised Table 6-5 dimensions

Revision 3.3 May 15, 2014
- Title change for commonality in style with QSFP

Revision 3.4 May 25, 2014
- Revised dimensions in Figures 6-1 and 6-2
- Added 6.2 section Title
- Revised Figure 6-7 and Table 6-3 titles
- Revised Titles for Figure 6-8 and Table 6-4
- Revised Table 6-4 to add the 1x2 size
- Revised text with section 6.3 and the section Title
- Revised Table 6-5 descriptions
- Revised Figure 6-12 Title
- Revised Figure 6-14 Title

Revision 3.5 September 22, 2014
- This specification created with the connector content removed from SFF-8643

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, and 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:
http://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.

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FIGURES

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SFF Committee

Mini Multilane 8/4X Unshielded Connector

1 Scope

This specification defines the Mini Multilane unshielded cable plug, the unshielded host board receptacle, and the latching requirements for them based upon the mating interface defined herein.

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 2212-D SAS-3
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8643 Mini Multilane 12 Gb/s 8/4X Unshielded Connector (HD12un)
- SFF-8644 Mini Multilane 12 Gb/s 8/4X Shielded Connector (HD12sh)
- SFF-8673 Mini Multilane 24 Gb/s 8/4X Unshielded Connector (HD24un)
- SFF-8674 Mini Multilane 24 Gb/s 8/4X Shielded Connector (HD24sh)

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 Inter-National 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).

2.4 Conventions

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

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

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

2.5 Definitions

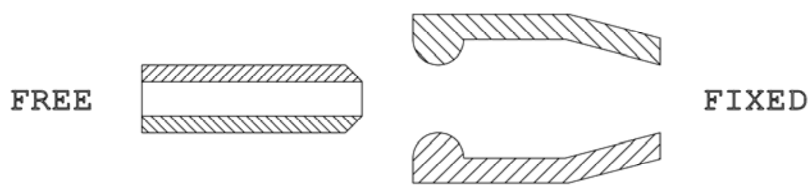
For the purpose of SFF Specifications, the following definitions apply:

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 specification "fixed" is specifically used to describe the mating side gender illustrated in Figure 3-1.

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 specification "free" is specifically used to describe the mating side gender illustrated in Figure 3-1.

Height: Distance from board surface to farthest overall connector feature

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.



Note: The fixed gender is used on the device side except in the case of wire termination.

FIGURE 2-1 MATING SIDE GENDER DEFINITION

PCB: Printed Circuit Board

Press-fit: Press-fit is a compliant pin, solder free process used to connect connector pins and tabs to a PCB. The mechanical and electrical interfaces between the connector and the PCB are made by a spring-like compliant pin and a plated thru hole (via).

PTH: Plated Through Hole

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.

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 board and are subsequently soldered to the printed circuit board.

3 Description

The connector system is based upon vertical and right angle receptacle (fixed) connectors and (free) mating plugs. The host board footprint mounting holes contain the critical dimensions for locating the receptacles to the host board. The integral receptacle guide shell functions as the guide and strain relief for the free (plug) connector interface and also provides the latching points for the plug connector. This connector system provides positive retention along with ease of insertion and removal.

3.1 General View

This specification provides for a 1x1, 1x2 and 1x4 receptacle (fixed side) as well as a 1x1 (4X) and a 1x2 (8X) vertical receptacles and the mating cable plugs (free side).

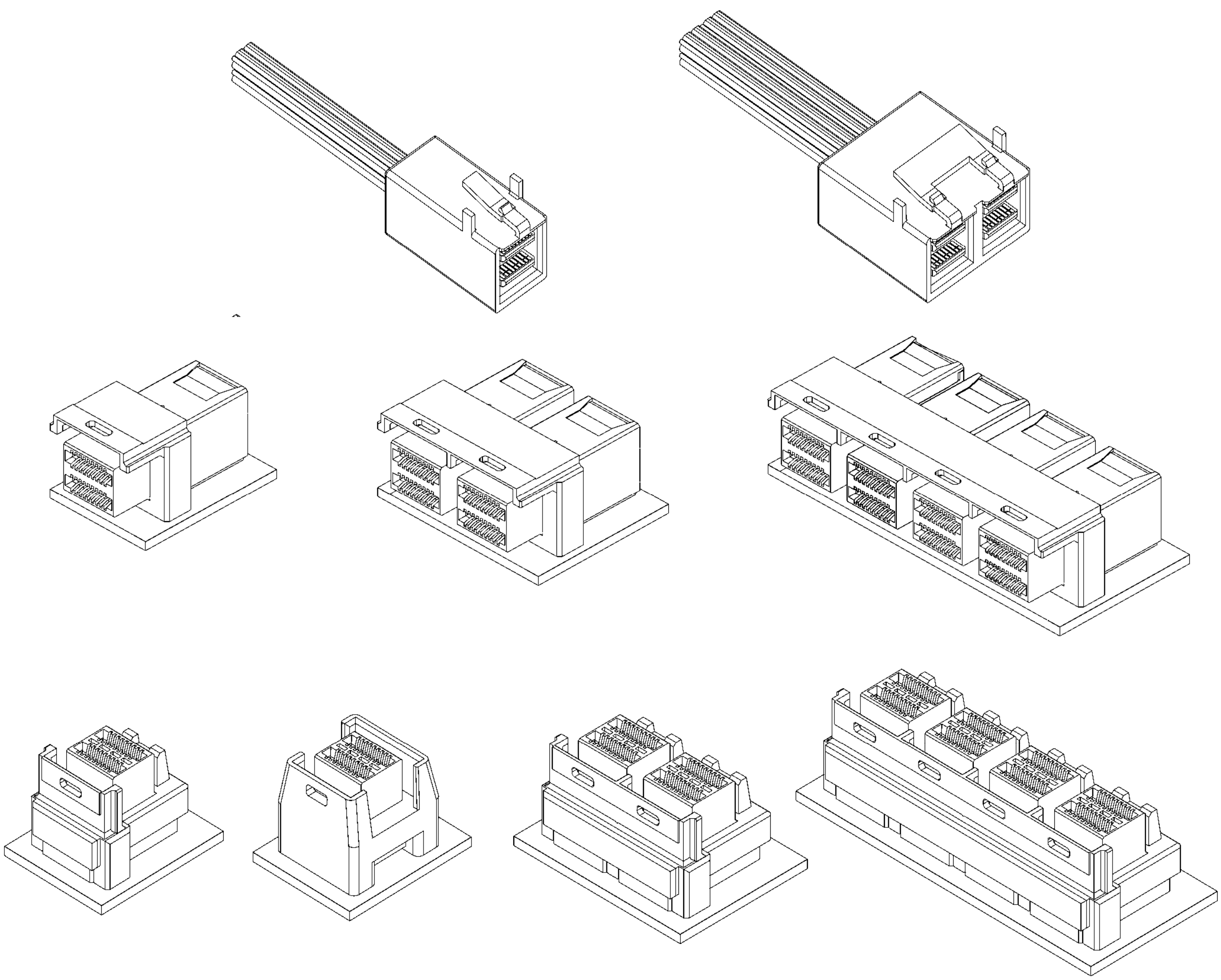


FIGURE 3-1 GENERAL VIEW OF CONFIGURATIONS

TABLE 3-1 CONFIGURATIONS

Port	Positions	Right Angle	Vertical Modular	Vertical Unitary	Plug
1x1	36	X	X	X	X
1x2	72	X	X	Not Shown	X
1x4	144	X	X	NA	NA

3.2 Pin Assignments

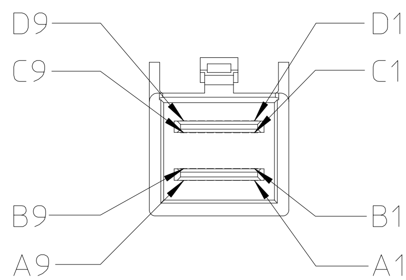


FIGURE 3-2 PLUG PIN ASSIGNMENTS

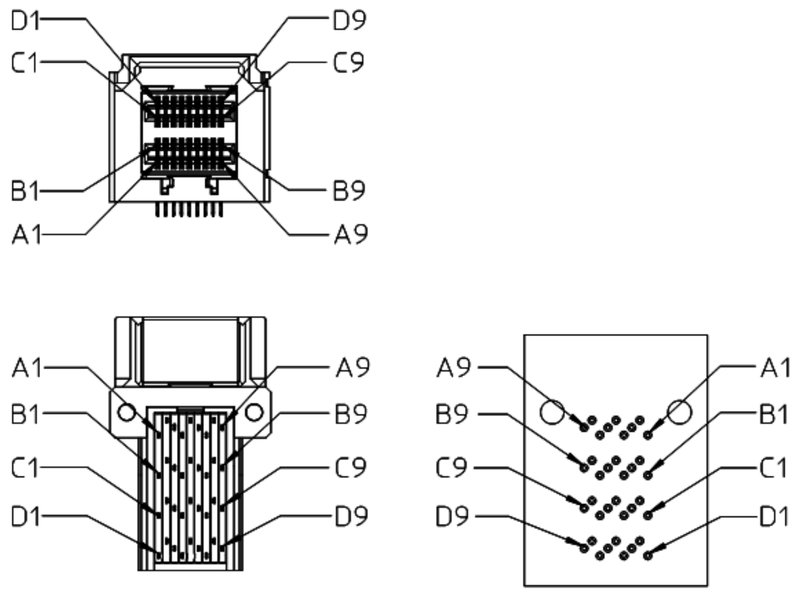


FIGURE 3-3 RIGHT ANGLE PIN ASSIGNMENTS

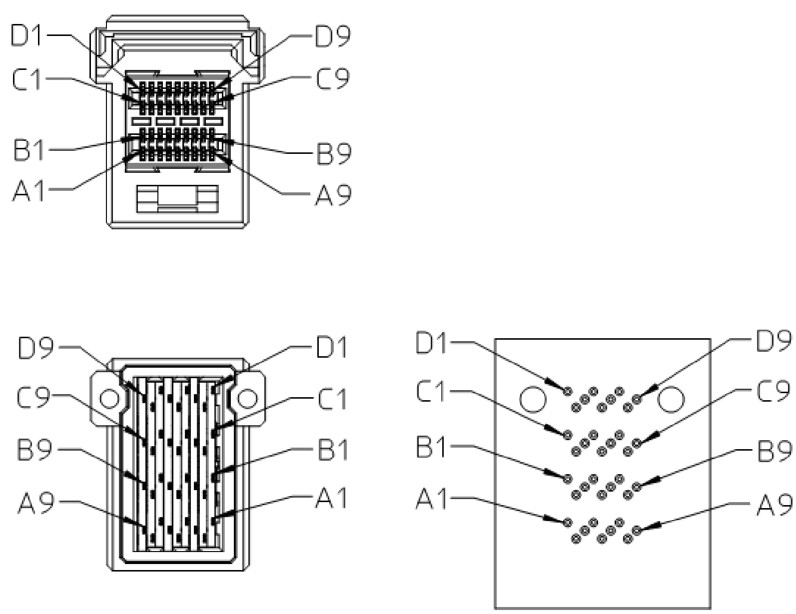


FIGURE 3-4 VERTICAL PIN ASSIGNMENTS

4 Datums

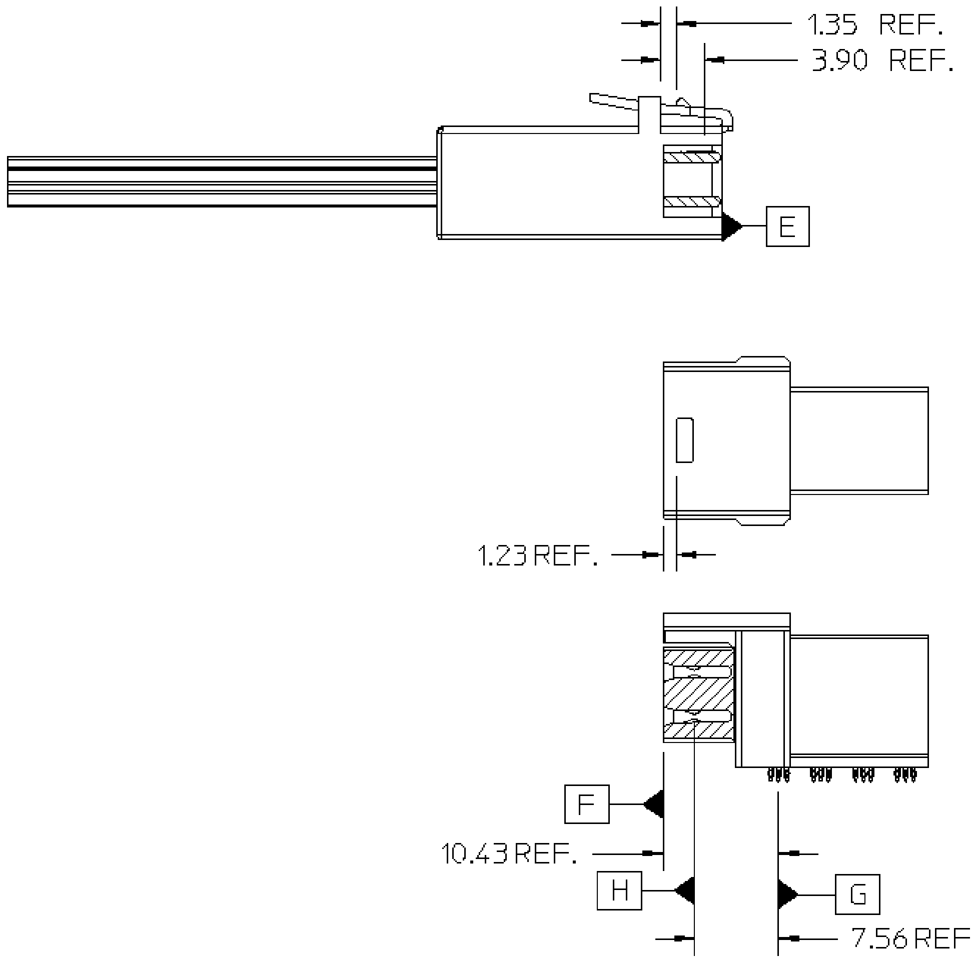


FIGURE 4-1 DATUMS (NOT ALL SHOWN)

TABLE 4-1 DATUM DESCRIPTIONS

Datum	Description
A	Width of Paddle Card
B	Top Surface of Paddle Card
C	Leading Edge of Third Mate Signal Pad on Paddle Card
D	Receptacle Housing Interface to PCB
E	Leading Edge of Plug Body
F	Front Edge of Receptacle Snout
G	Centerline of Second Row of First Group of Compliant Tails
H	Centerline of Receptacle Contacts - Lower Row
P	Width of Receptacle Card Slot
J	Centerline of Outer Holes
K	Centerline of Second Row of First Group of PCB Holes
L	Surface of PCB
M	Bottom of Plug Snout Opening
N	Centerline of Plug Snout Opening

5 Plug Requirements

5.1 Plug Paddle Card

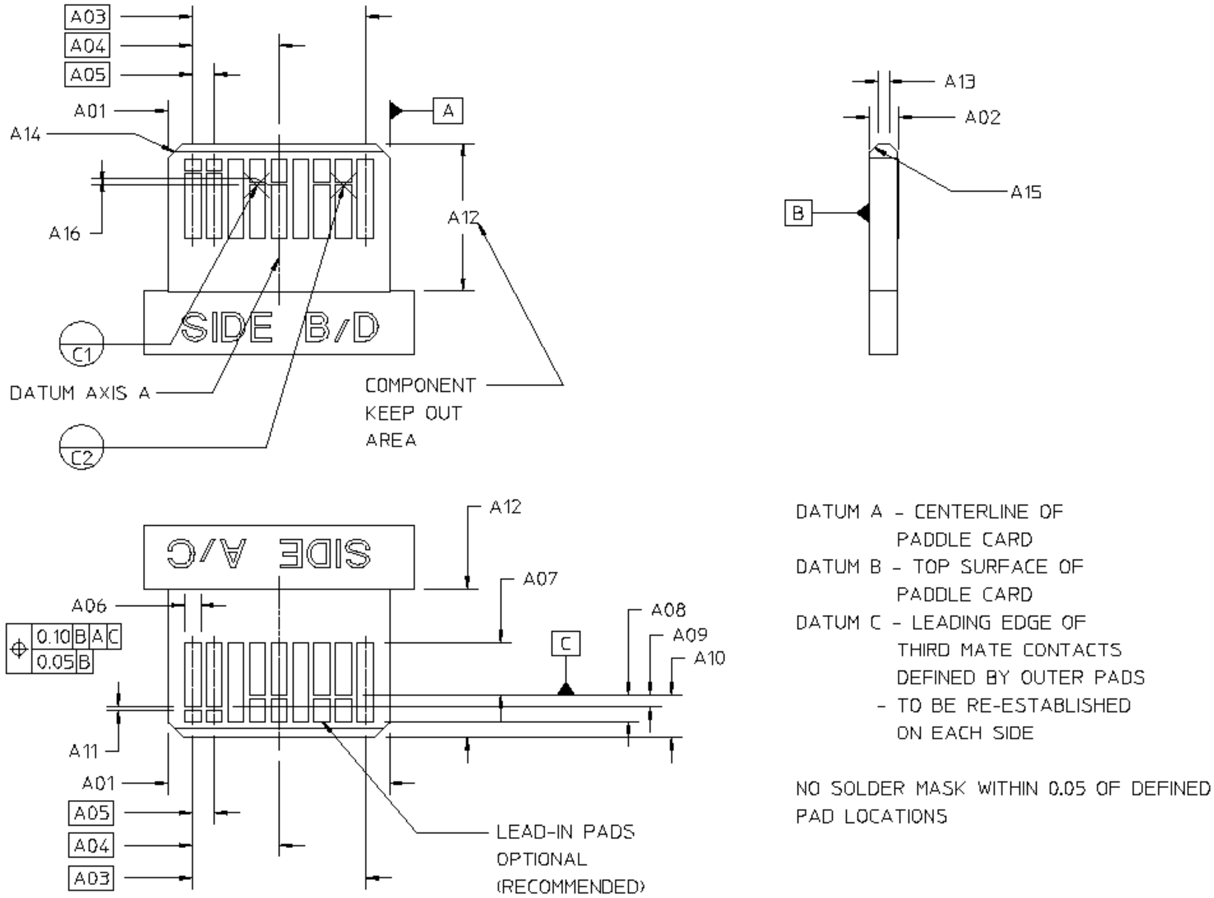


FIGURE 5-1 PLUG PADDLE CARD

TABLE 5-1 PLUG PADDLE CARD DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
A01	Paddle Card Width	7.65	0.10
A02	Paddle Card Thickness (across pads)	1.00	0.10
A03	First to Last Pad Centers	6.00	Basic
A04	Card Center to Outer Pad Center	3.00	Basic
A05	Pad Center to Center (Pitch)	0.75	Basic
A06	Pad Width	0.57	0.03
A07	Pad Length - Third Mate	1.85	Min
A08	Third Mate to First Mate	0.90	0.05
A09	Third Mate to Second Mate	0.40	0.05
A10	Card Edge to Third Mate Pad	1.45	0.10
A11	Pad to Pre-Pad	0.10	0.05
A12	Component Keep Out Area	5.40	Min
A13	Lead-in Flat	0.40	Ref
A14	Lead-in Chamfer x 45 degrees	0.50	0.05
A15	Lead-in Chamfer x 45 degrees	0.30	0.05
A16	Third Mate Pad to Datum C	0.00	0.03

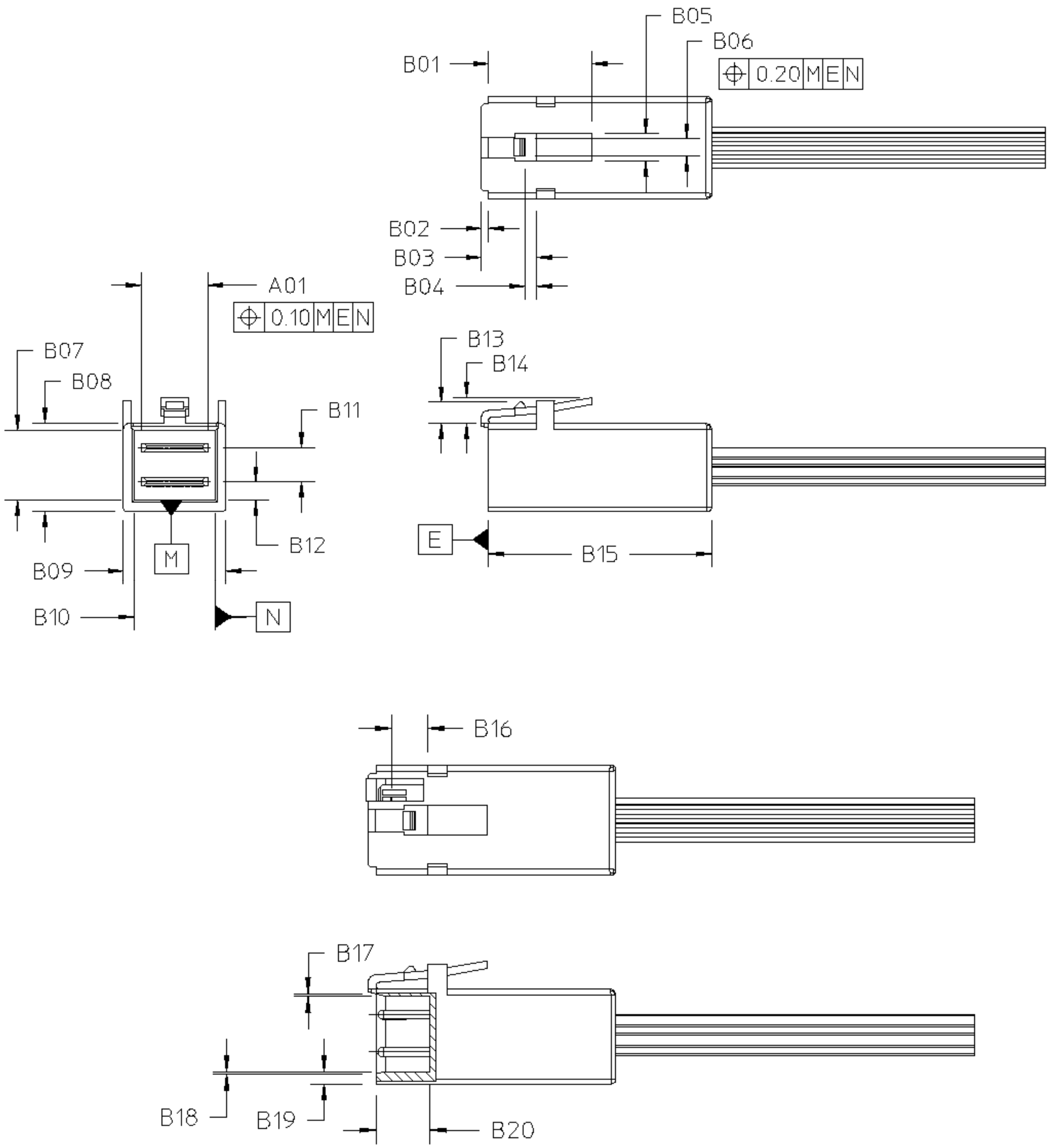


FIGURE 5-2 4X PLUG

TABLE 5-2 4X PLUG DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
B01	Plug Front to Latch	11.00	Min
B02	Plug Lead-In	0.83	0.15
B03	Plug Front to Latch Stop	6.39	0.08
B04	Plug Front to Latch Barb	1.35	0.08
B05	Latch Width	3.20	Ref.
B06	Latch Barb Width	2.00	0.15
B07	Snout Height - Inside	8.15	0.08
B08	Snout Height - Outside	10.28	0.10
B09	Snout Width - Outside	11.85	0.10
B10	Snout Width - Inside	9.40	0.08
B11	Upper PCB to Lower PCB	4.00	0.10
B12	Snout Top to Upper PCB	2.14	0.10
B13	Latch Barb Height	2.49	Ref.
B14	Latch Height	3.00	0.75
B15	Plug Body Length	27.00	Max
B16	Latch Barb to PCB Third Mate Pad Front	3.90	0.08
B17	Plug Opening Lead-In	0.25	0.10
B18	Plug Opening Lead-In	0.25	0.10
B19	Snout - Lower Thickness	1.33	0.05
B20	Plug Opening Depth	5.80	Min

5.2 8X Plug

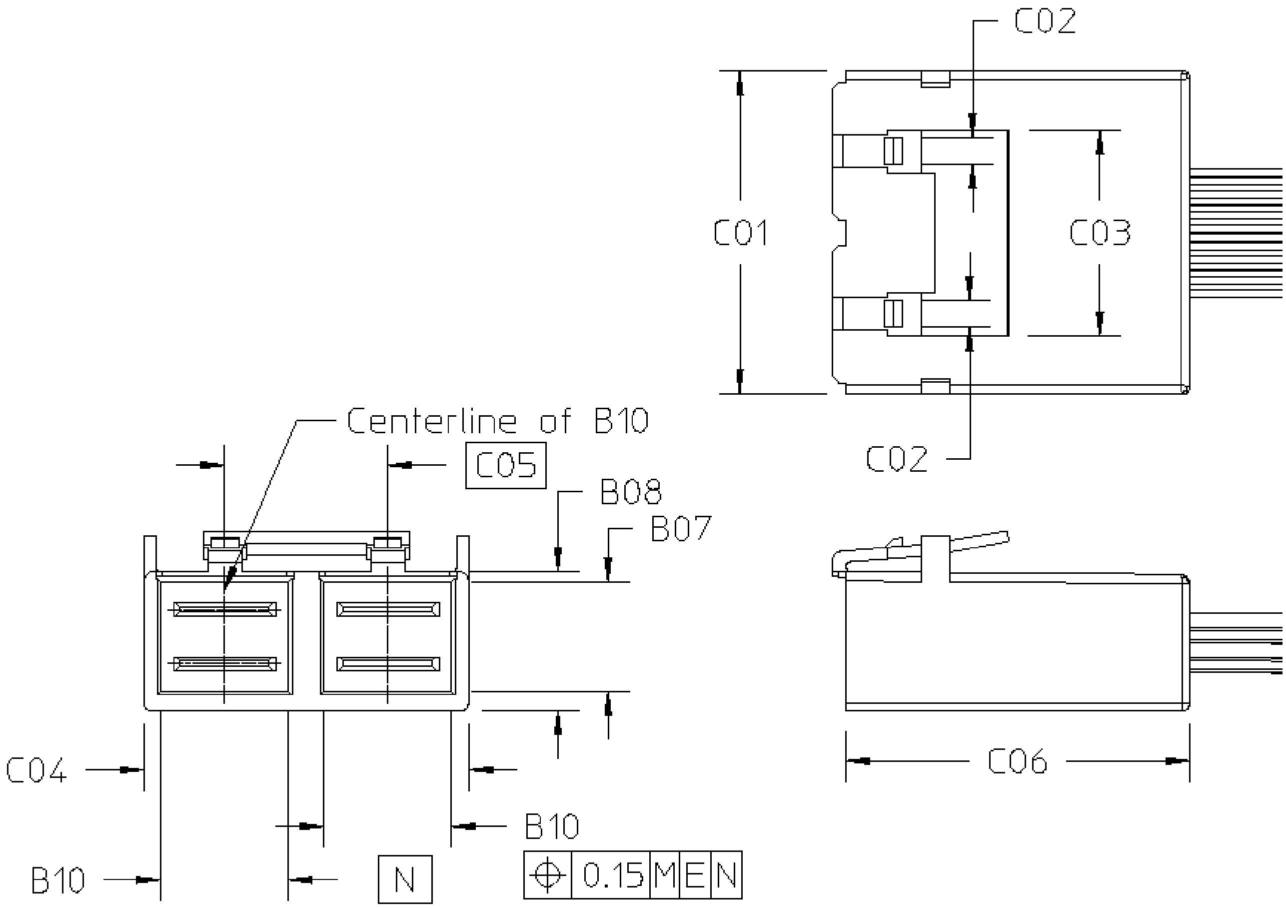
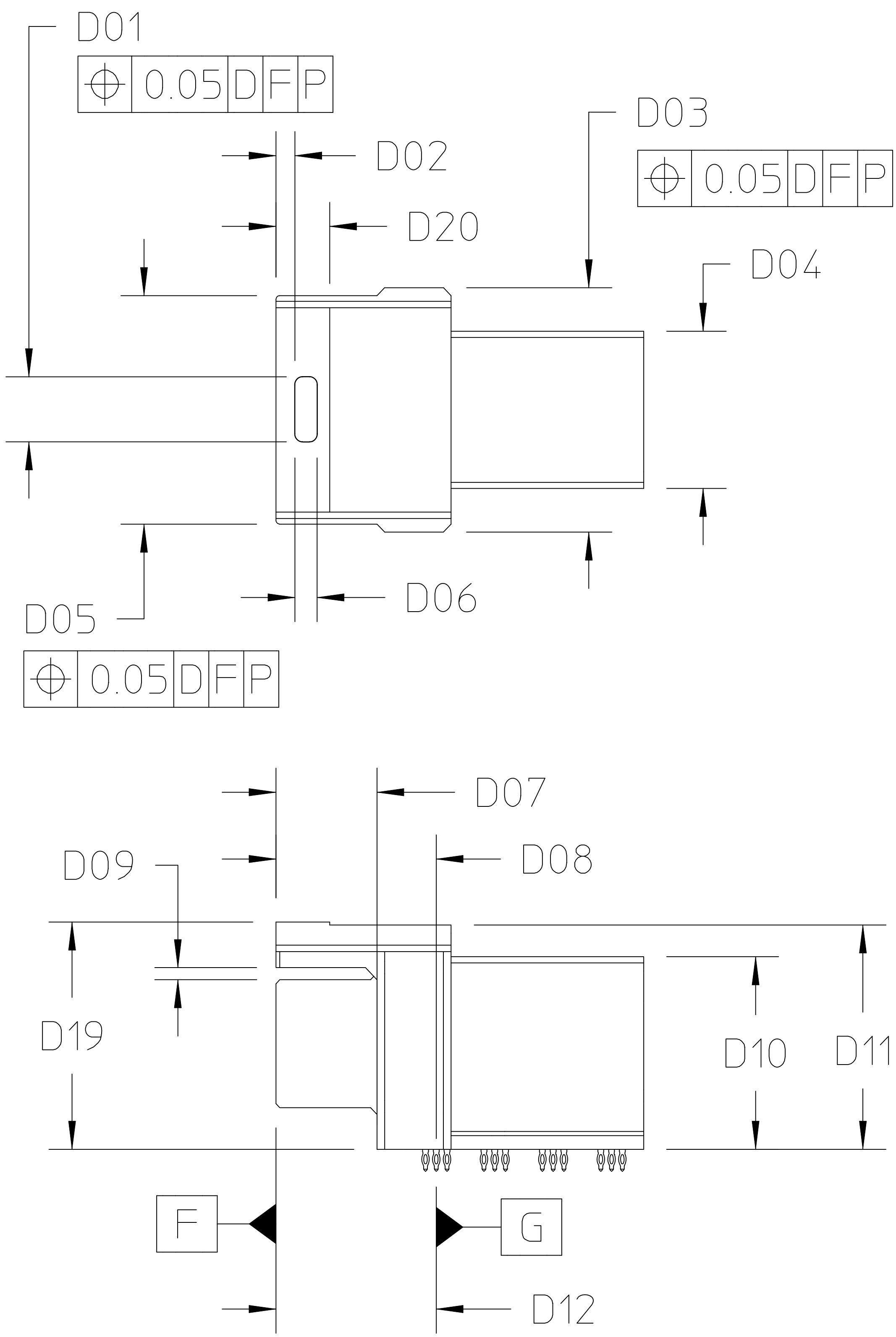


FIGURE 5-3 8X PLUG

TABLE 5-3 8X PLUG DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
C01	Plug Body Width	23.85	0.15
C02	Latch Barb Width	2.00	0.15
C03	Latch Width	15.20	Ref
C04	Snout Width - Outside	23.85	0.10
C05	Port Spacing	12.00	Basic
C06	Plug Body Length	27.00	Max

6 Receptacle Requirements



Datum G is defined by the center of tails A1 and A7

FIGURE 6-1 RIGHT ANGLE RECEPTACLE DIMENSIONS (1)

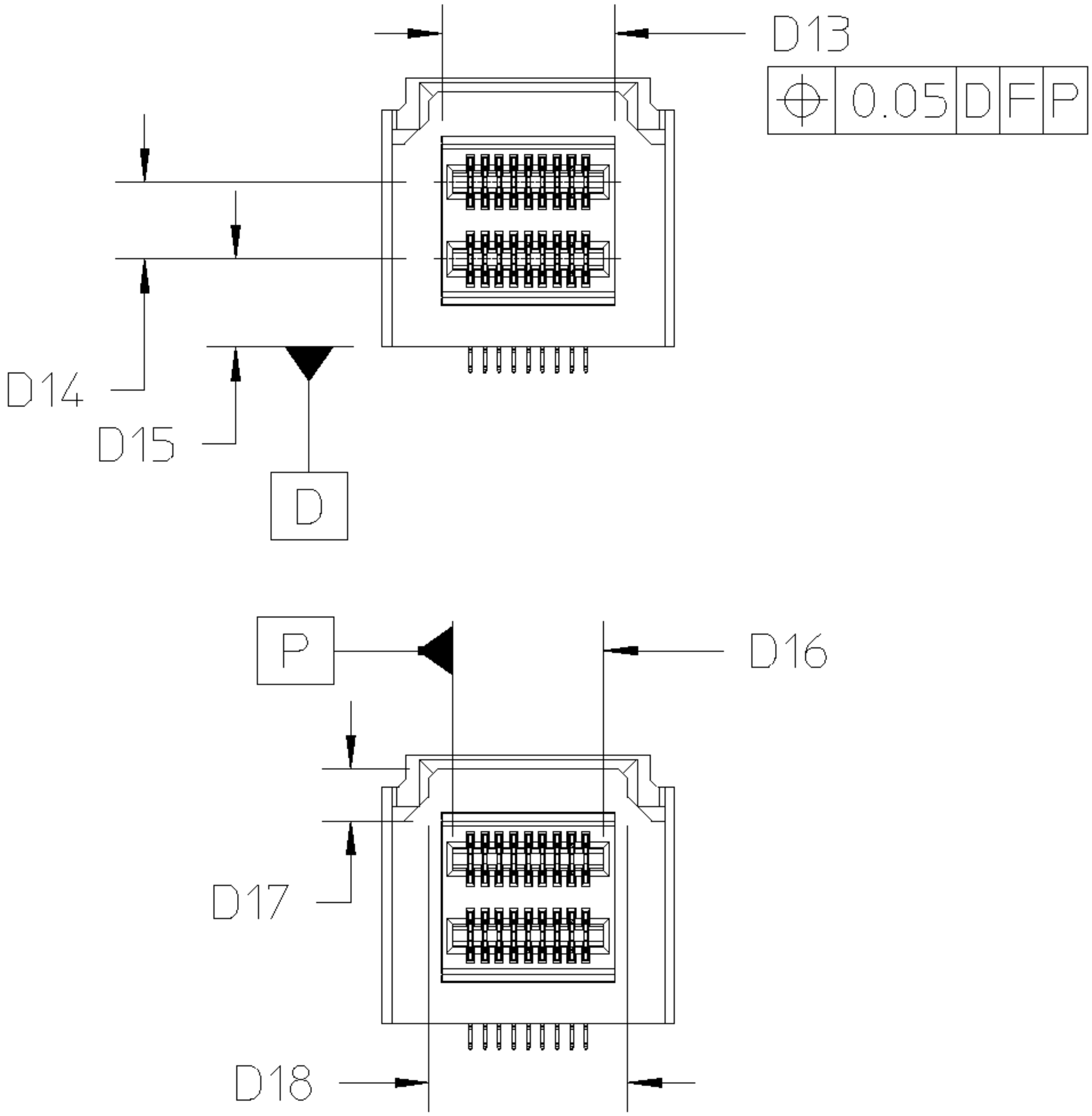
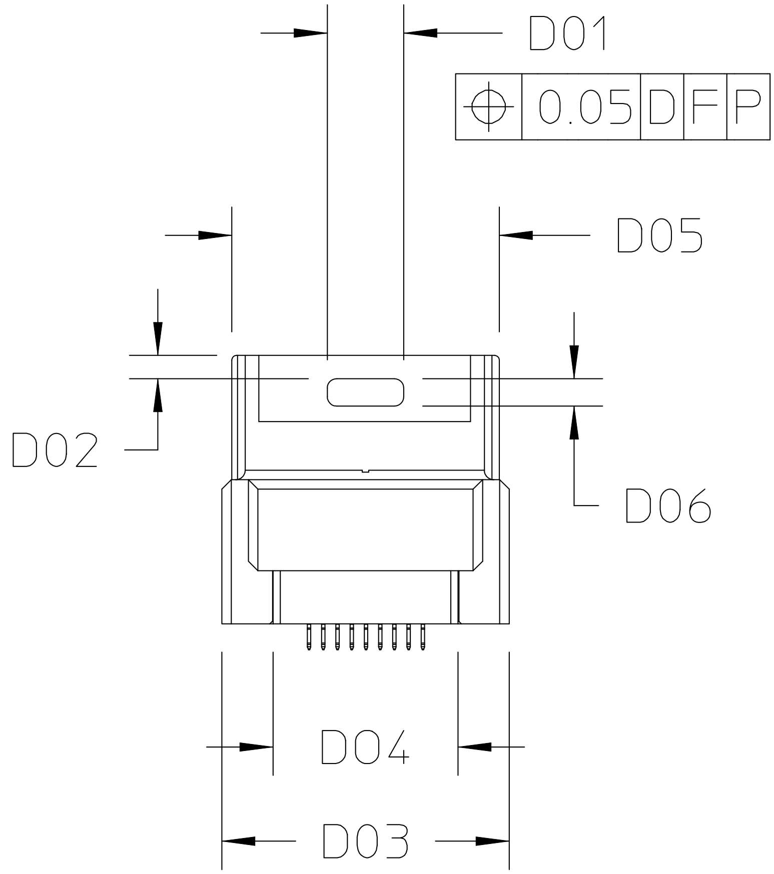


FIGURE 6-2 RIGHT ANGLE RECEPTACLE DIMENSIONS(2)

TABLE 6-1 RIGHT ANGLE RECEPTACLE DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
D01RA	Latch Slot Width	4.03	0.13
D02RA	Front Face to Latch Slot	1.22	0.05
D03RA	Latch Frame Width	15.16	0.13
D04RA	Body Width	9.75	0.25
D05RA	Latch Frame Width	14.17	0.13
D06RA	Latch Slot Length	1.35	Min
D07RA	Length of Snout from Datum F	6.58	0.08
D08RA	Datum G to Front of Latch Frame	10.43	0.13
D09RA	Snout to Latch Frame Bottom - Side	0.75	0.13
D10RA	Body Height	11.95	0.25
D11RA	Overall Height	13.92	0.25
D12RA	Datum G to Front Face	10.43	0.15
D13RA	Snout Width	8.95	0.08
D14RA	Lower Card Slot to Upper Card Slot	4.00	0.10
D15RA	Lower Card Slot Location	4.55	0.10
D16RA	Receptacle Card Slot Width	7.85	0.05
D17RA	Snout to Latch Frame Bottom	2.70	0.10
D18RA	Latch Frame Opening	10.34	0.10
D19RA	Overall Height	14.35	Max
D20RA	Latch Frame Step Width	3.50	Max



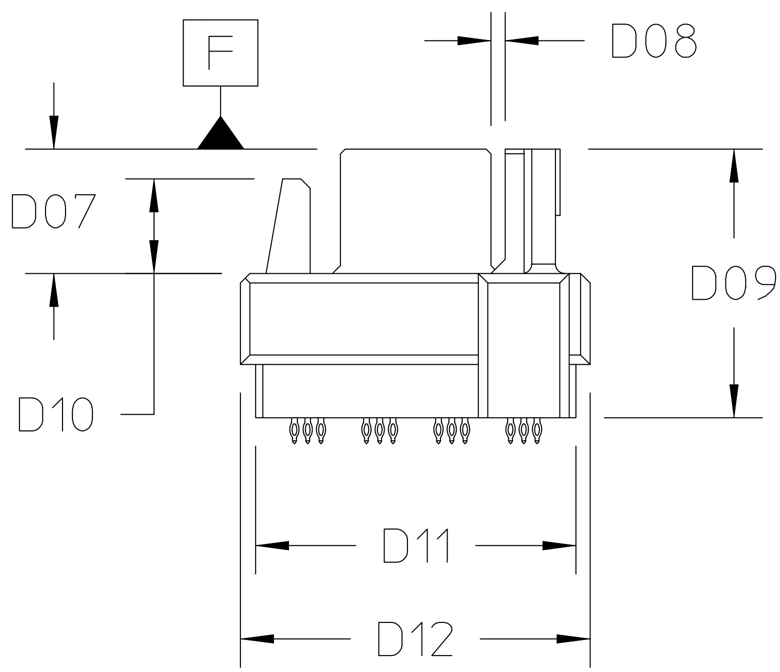


FIGURE 6-3 1X1 VERTICAL MODULAR RECEPTACLE (1)

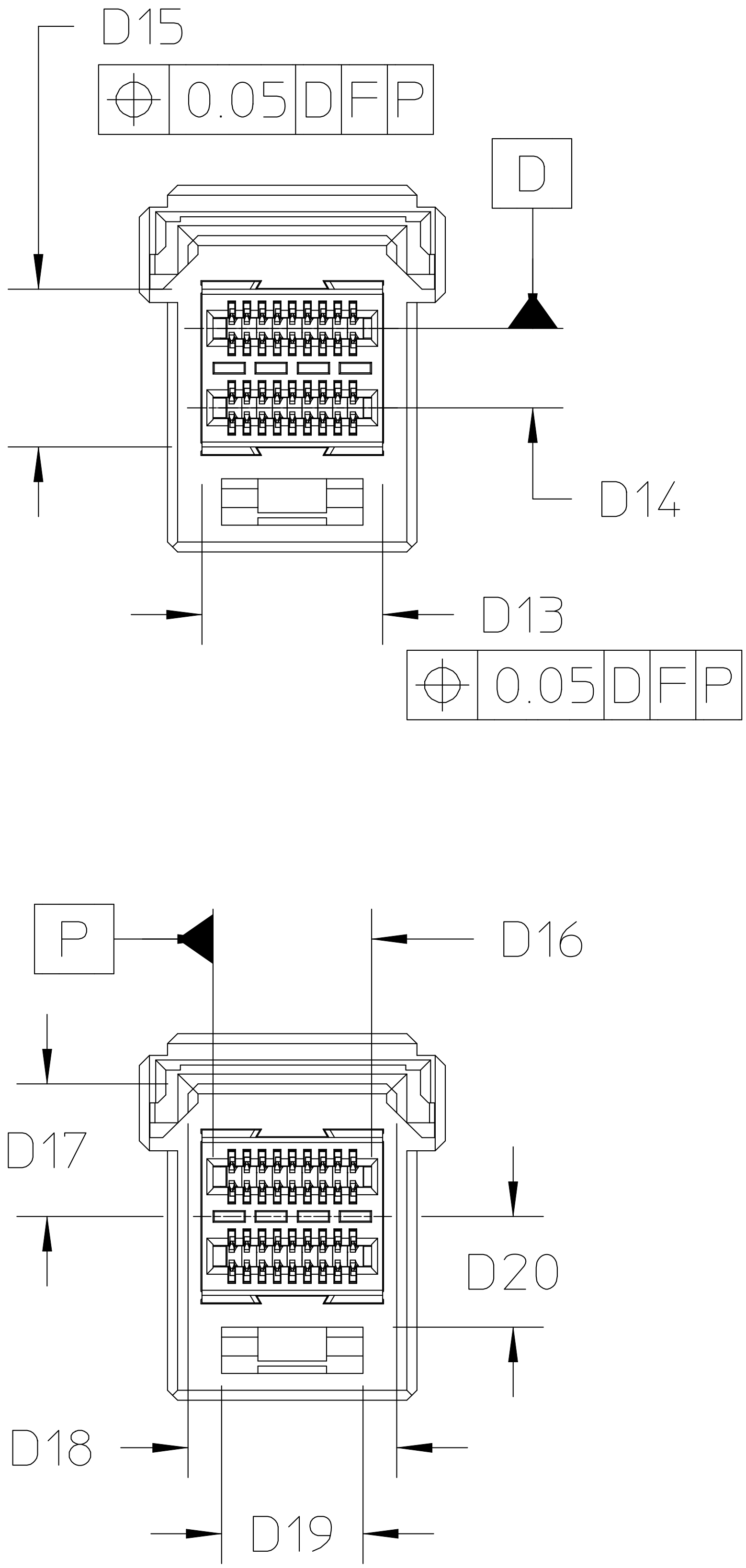


FIGURE 6-4 1X1 VERTICAL MODULAR RECEPTACLE (2)

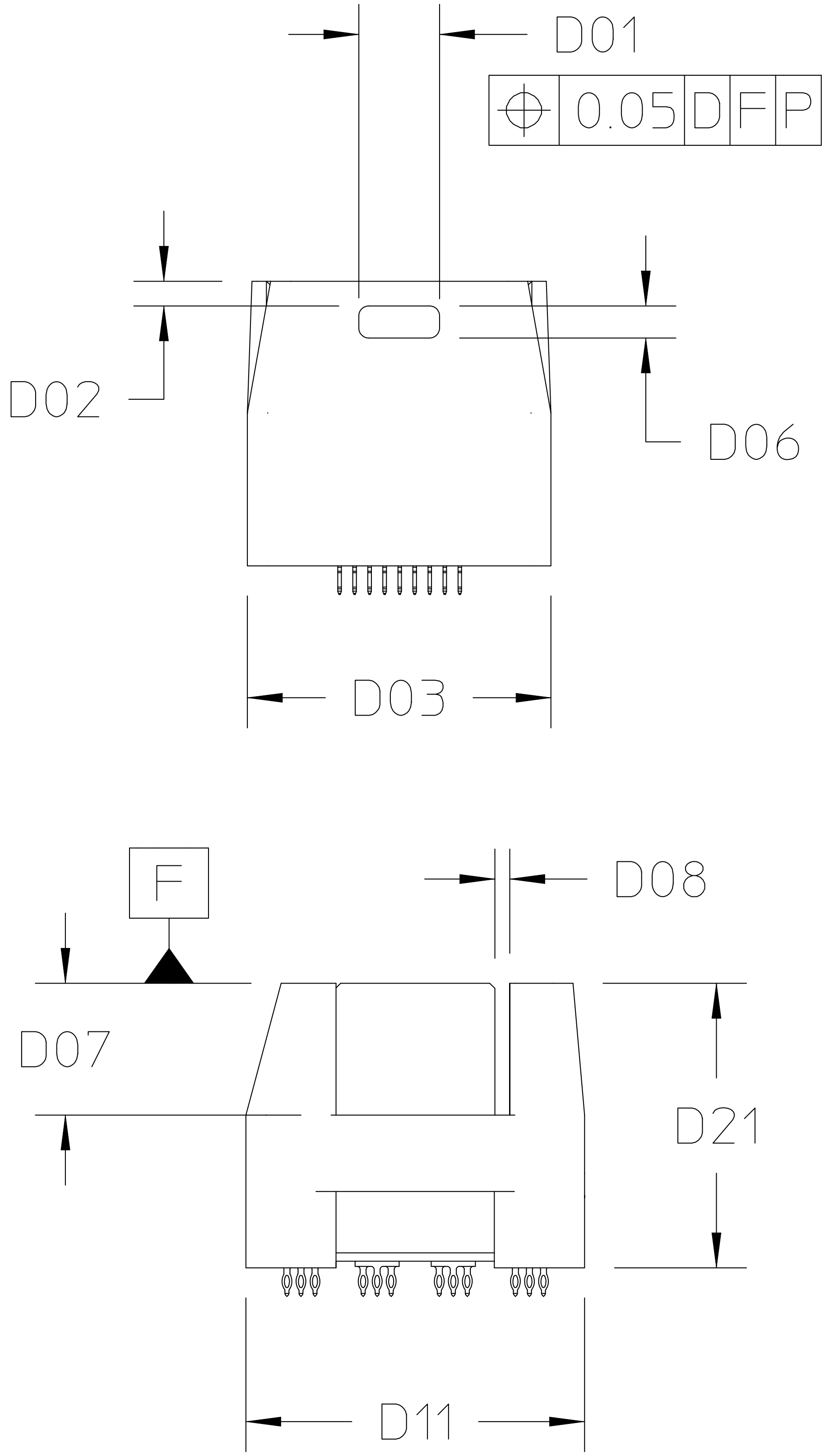
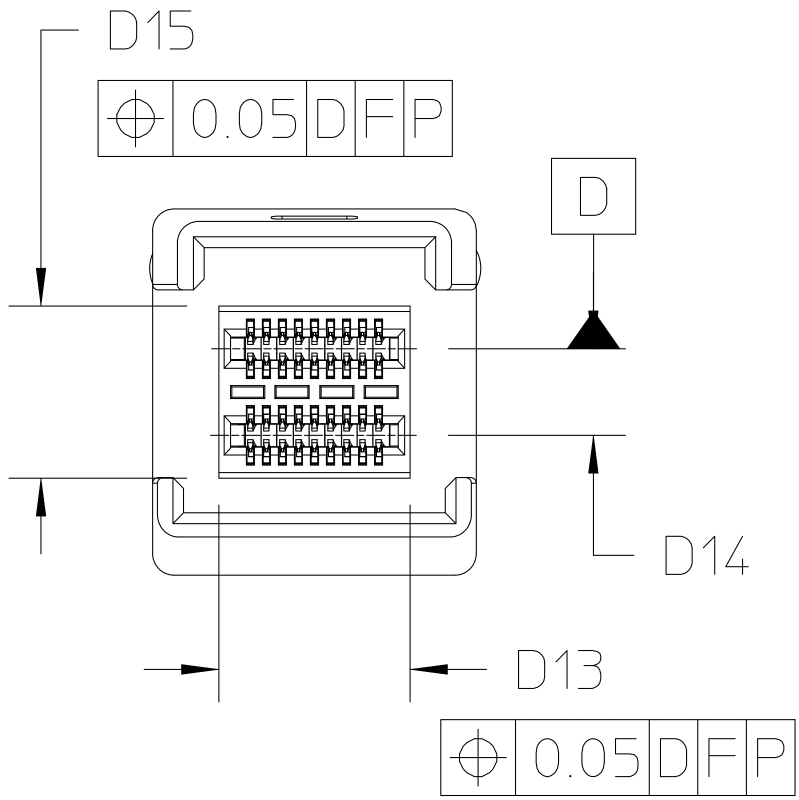


FIGURE 6-5 1X1 VERTICAL UNITARY RECEPTACLE (1)



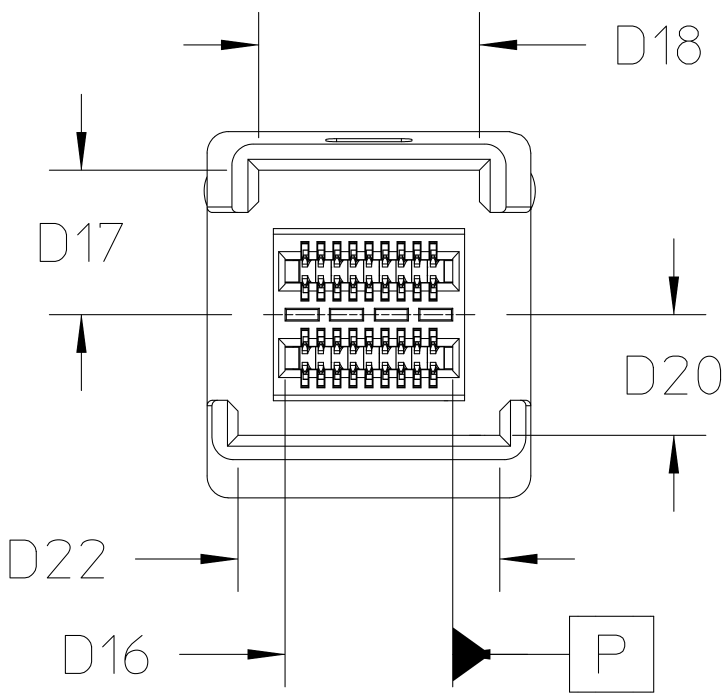
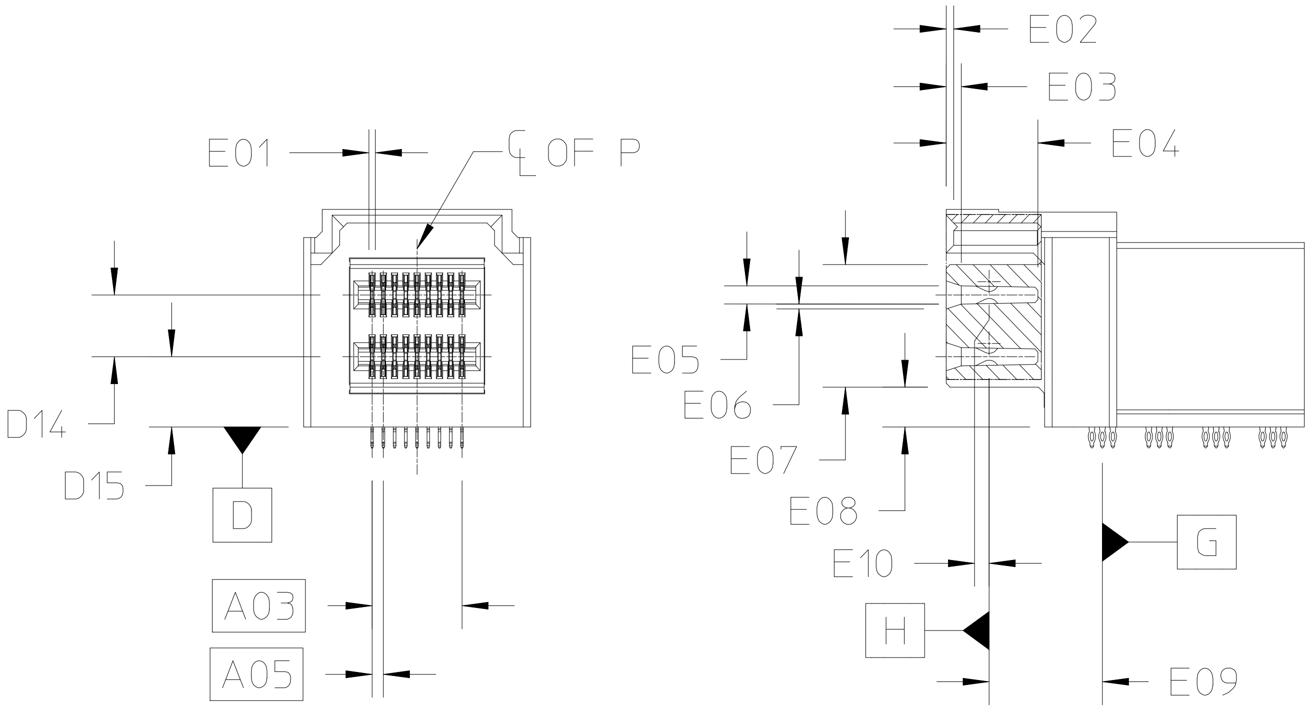


FIGURE 6-6 1X1 VERTICAL UNITARY RECEPTACLE

TABLE 6-2 1X1 VERTICAL RECEPTACLE DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
D01VT	Latch Slot Width	4.03	0.13
D02VT	Latch Frame Edge to Slot	1.22	0.05
D03VT	Latch Frame Base Width	15.16	0.13
D04VT	Housing Body Base Width	9.75	0.25
D05VT	Latch Frame Width	14.17	0.13
D06VT	Latch Slot Length	1.35	Min
D07VT	Length of Snout from Datum F	6.58	0.08
D08VT	Snout to Latch Frame	0.75	0.13
D09VT	Overall Height	13.92	0.25
D10VT	Plug Anti-Rotation Rib Height	5.00	0.25
D11VT	Housing Body Base Length	17.03	Max
D12VT	Latch Frame Length	18.45	0.13
D13VT	Snout Width	8.95	0.08
D14VT	Lower Card Slot to Upper Card Slot	4.00	0.10
D15VT	Snout Length	7.94	0.08
D16VT	Card Slot Width	7.85	0.05
D17VT	Latch Frame to Datum D Centerline	6.67	0.10
D18VT	Latch Frame Plug Opening	10.34	0.10
D19VT	Plug Anti-Rotation Rib Width	7.00	0.13
D20VT	Anti-Rotation Rib to Datum D Centerline	5.47	Min
D21VT	Overall Height	14.45	Max
D22VT	Latch Frame Anti-Rotation Plug Opening	12.05	Min

6.1 Receptacle Contact Locations



Datum H is defined by the end contact pairs of the lower contacts.

FIGURE 6-7 1X1 RIGHT ANGLE RECEPTACLE CONTACT LOCATIONS

TABLE 6-3 1X1 RIGHT ANGLE RECEPTACLE CONTACT LOCATION DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
E01 (*)	Contact Zone (0.18 wide terminal)	0.28	Max
	Contact Zone (0.20 wide terminal)	0.30	Max
	Contact Zone (0.22 wide terminal)	0.32	Max
	Contact Zone (0.24 wide terminal)	0.34	Max
E02	Latch Chamfer x 45°	0.50	0.15
E03	Card Slot Lead-In	1.00	0.25
E04	Card Slot Depth	6.13	0.15
E05	Receptacle Card Slot Height	1.20	0.08
E06	Receptacle Card Slot Lead-In	0.30	0.10
E07	Receptacle Snout Height	7.94	0.10
E08	Receptacle Snout Bottom to Receptacle Bottom	2.58	0.10
E09	Datum G to Contact Interface	7.56	0.10
E10	Upper to Lower Row of Contacts	0.00	0.05
(*) Note: Contact Zone is defined as a zone with its centerline located at the theoretical contact centerline and the contact must always be completely located within it.			

6.2 Receptacle Hold Down and Pitch

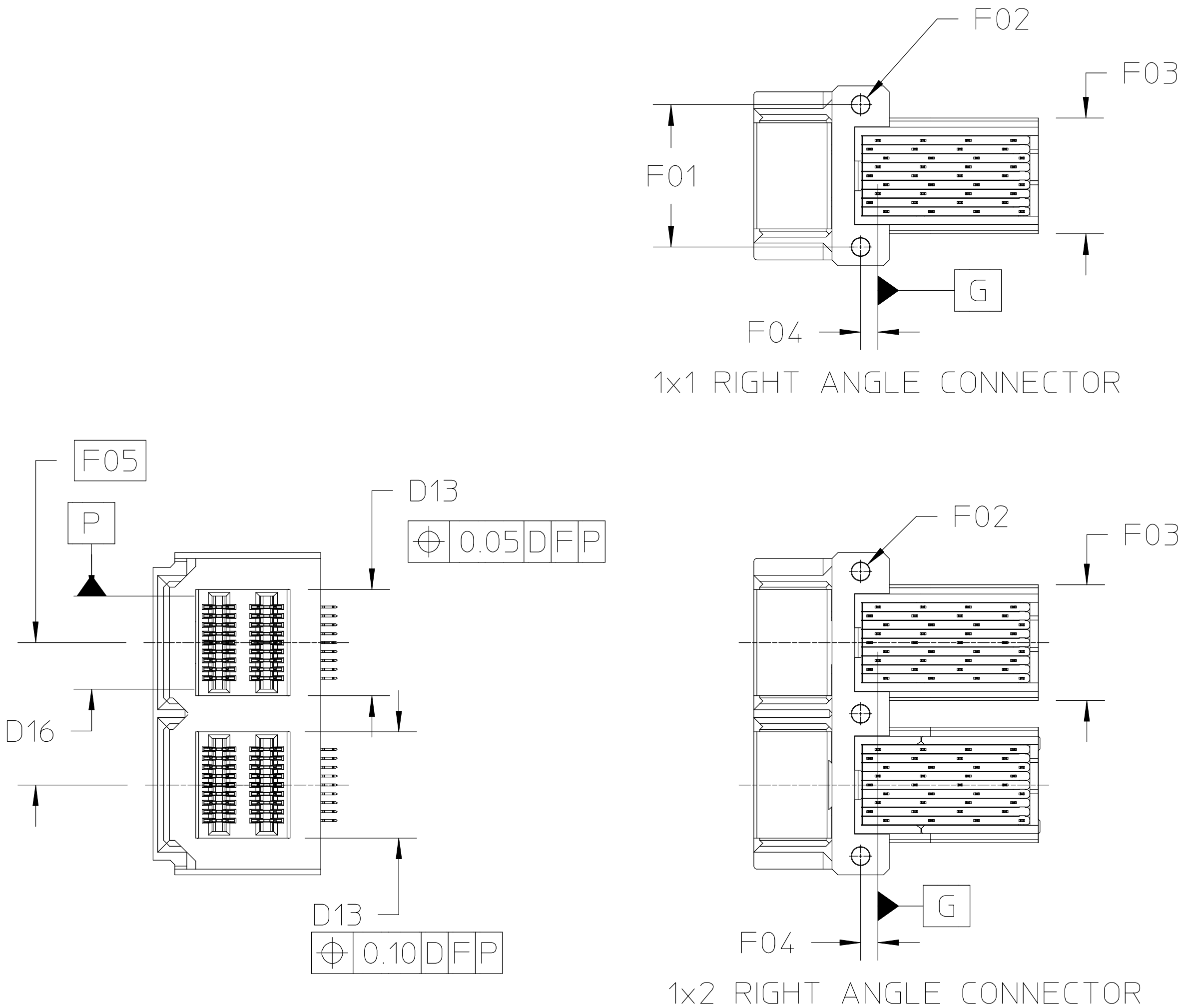


FIGURE 6-8 1-X-2 RIGHT ANGLE RECEPTACLE HOLD-DOWN AND PITCH

TABLE 6-4 1-X-2 RIGHT ANGLE RECEPTACLE HOLD-DOWN AND PITCH DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
F01	Mounting Hole to Mounting Hole	12.00	0.05
F02	Mounting Hole Diameter	1.80	Ref
F03	1x1 Right Angle Connector Body Width	9.75	0.25
F03	1x2 Right Angle Connector Body Width	21.75	0.25
F04	Datum G to Mounting Hole	1.45	0.15
F05	1-x-n Port to Port Spacing	12.00	Basic

6.3 Receptacle Footprints

For applications requiring higher PCB-to-receptacle retention, optional mounting hole(s) may be implemented in the defined location on the footprint(s) and the corresponding Vertical Unitary receptacle versions.

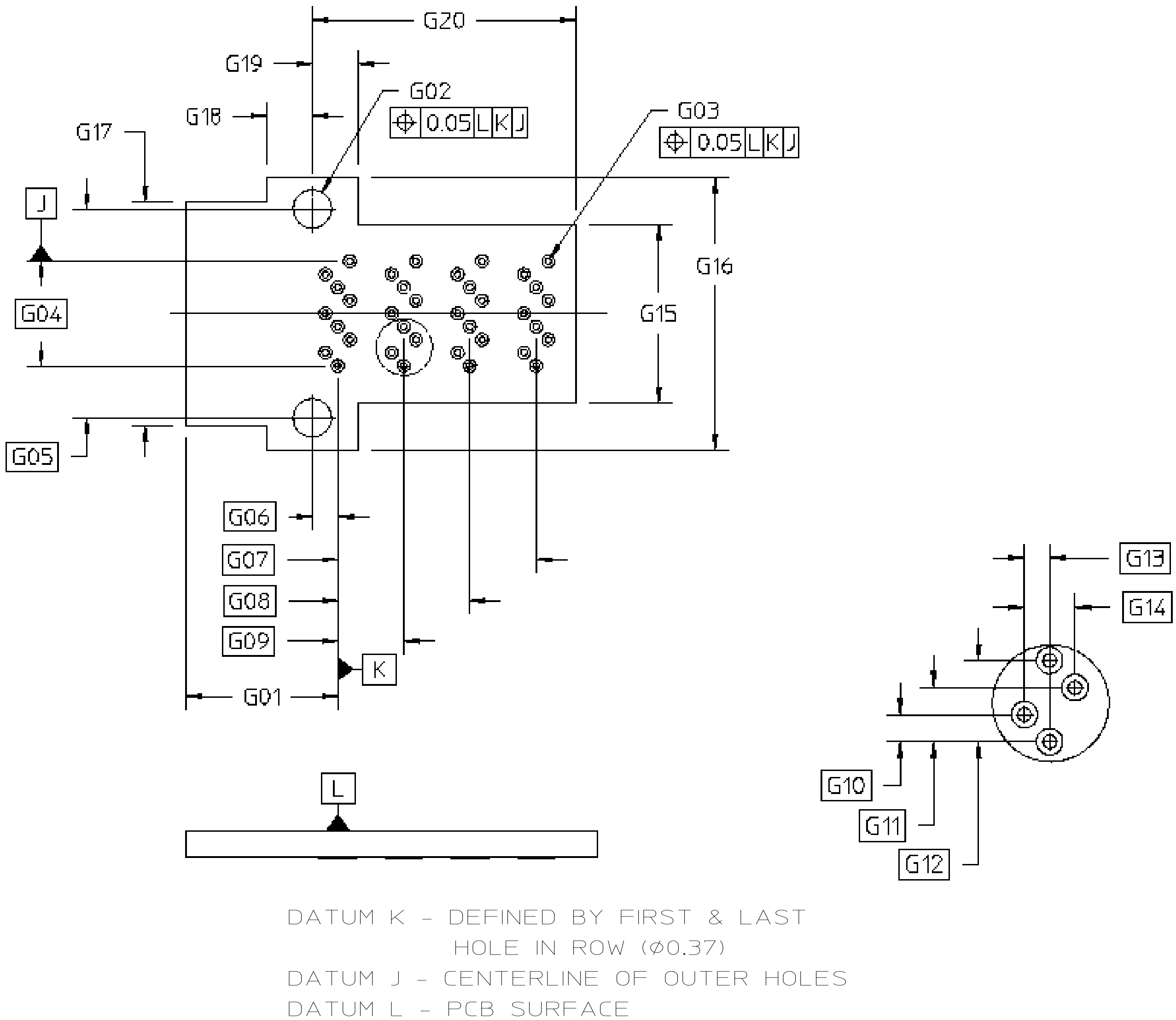
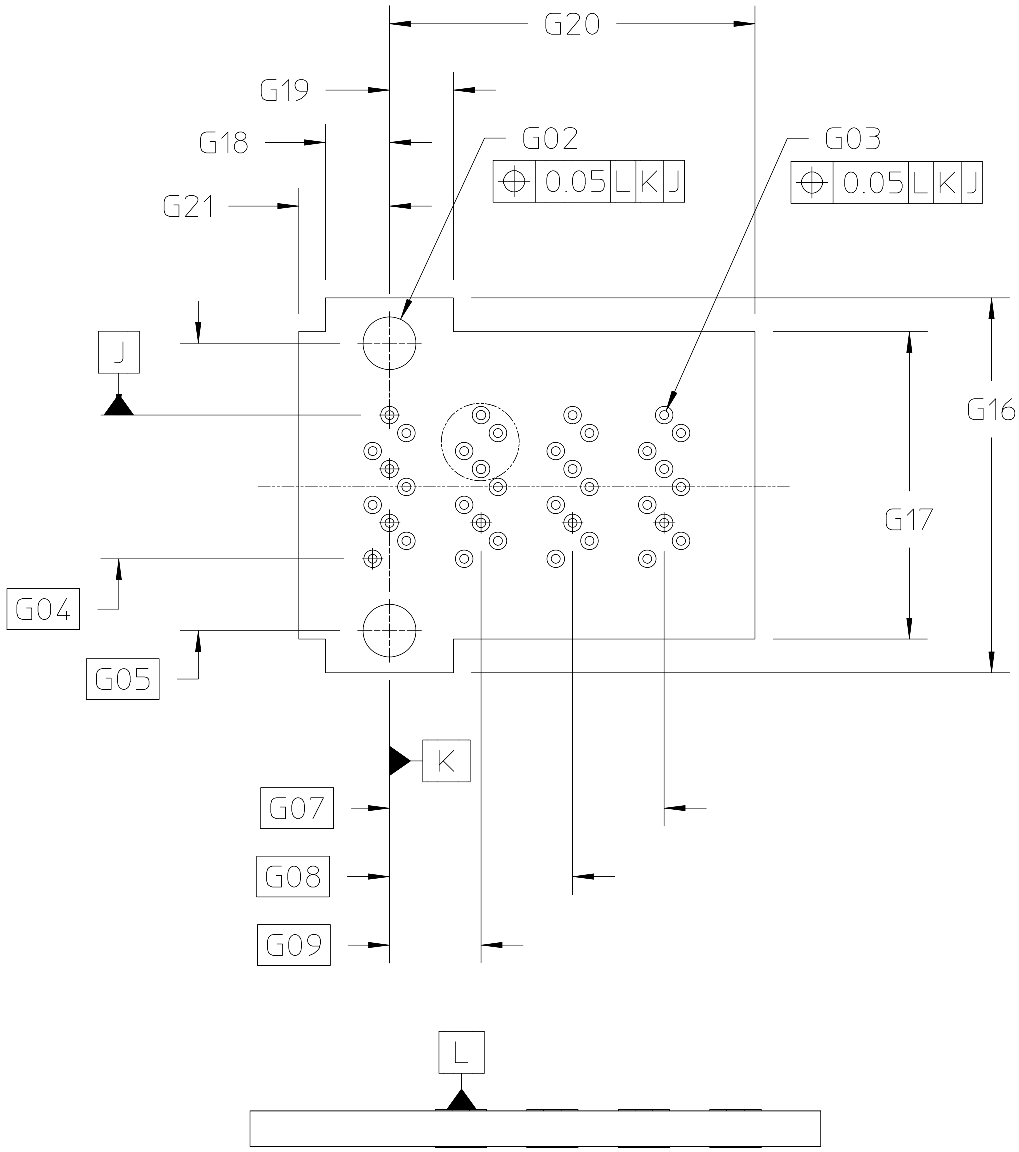
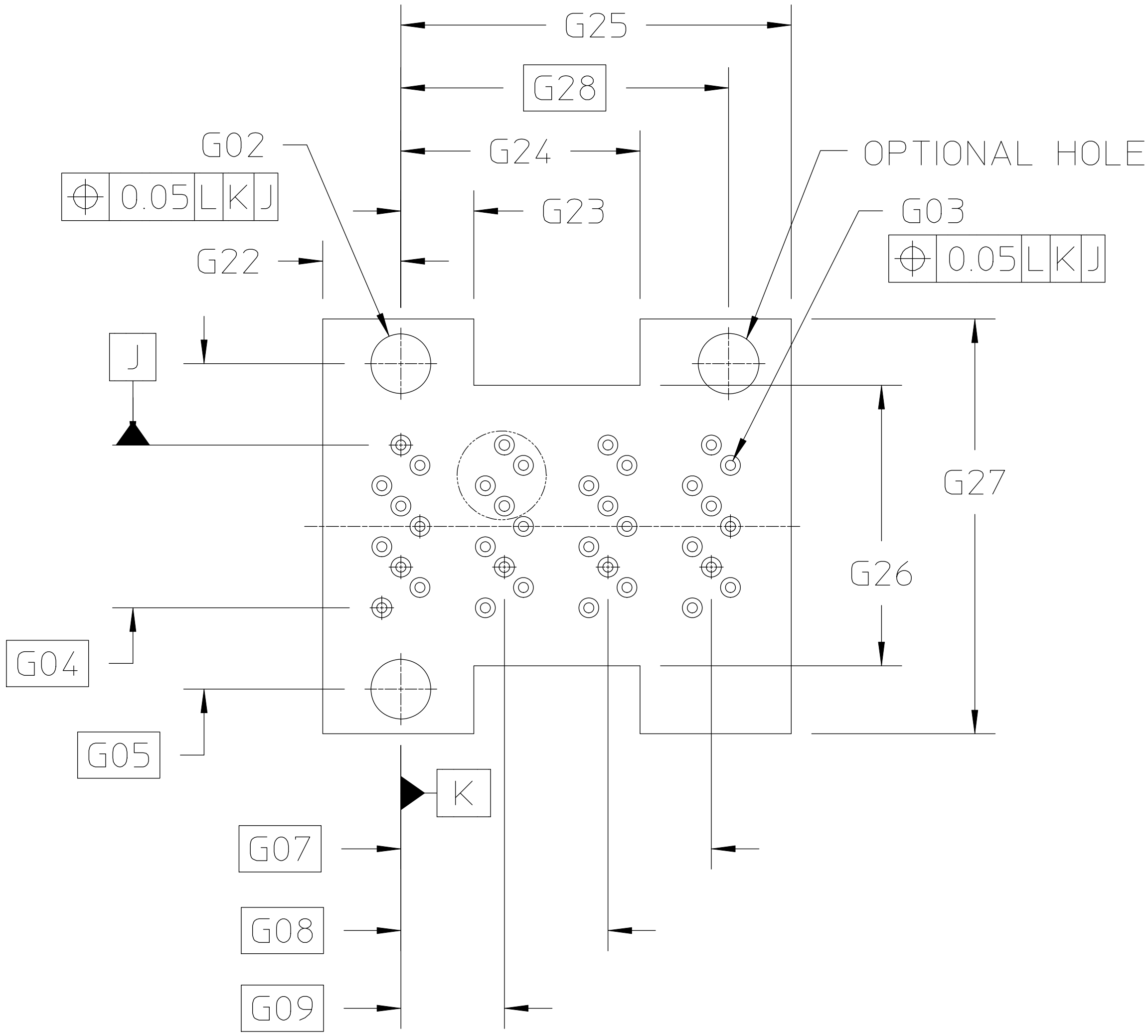


FIGURE 6-9 1X1 RIGHT ANGLE RECEPTACLE FOOTPRINT



DATUM K - DEFINED BY FIRST & LAST
HOLE IN ROW (⌀0.37)
DATUM J - CENTERLINE OF OUTER HOLES
DATUM L - PCB SURFACE

FIGURE 6-10 1X1 VERTICAL MODULAR RECEPTACLE FOOTPRINT



DATUM K - DEFINED BY FIRST & LAST
HOLE IN ROW (Ø0.37)
DATUM J - CENTERLINE OF OUTER HOLES
DATUM L - PCB SURFACE

FIGURE 6-11 1X1 VERTICAL UNITARY RECEPTACLE FOOTPRINT

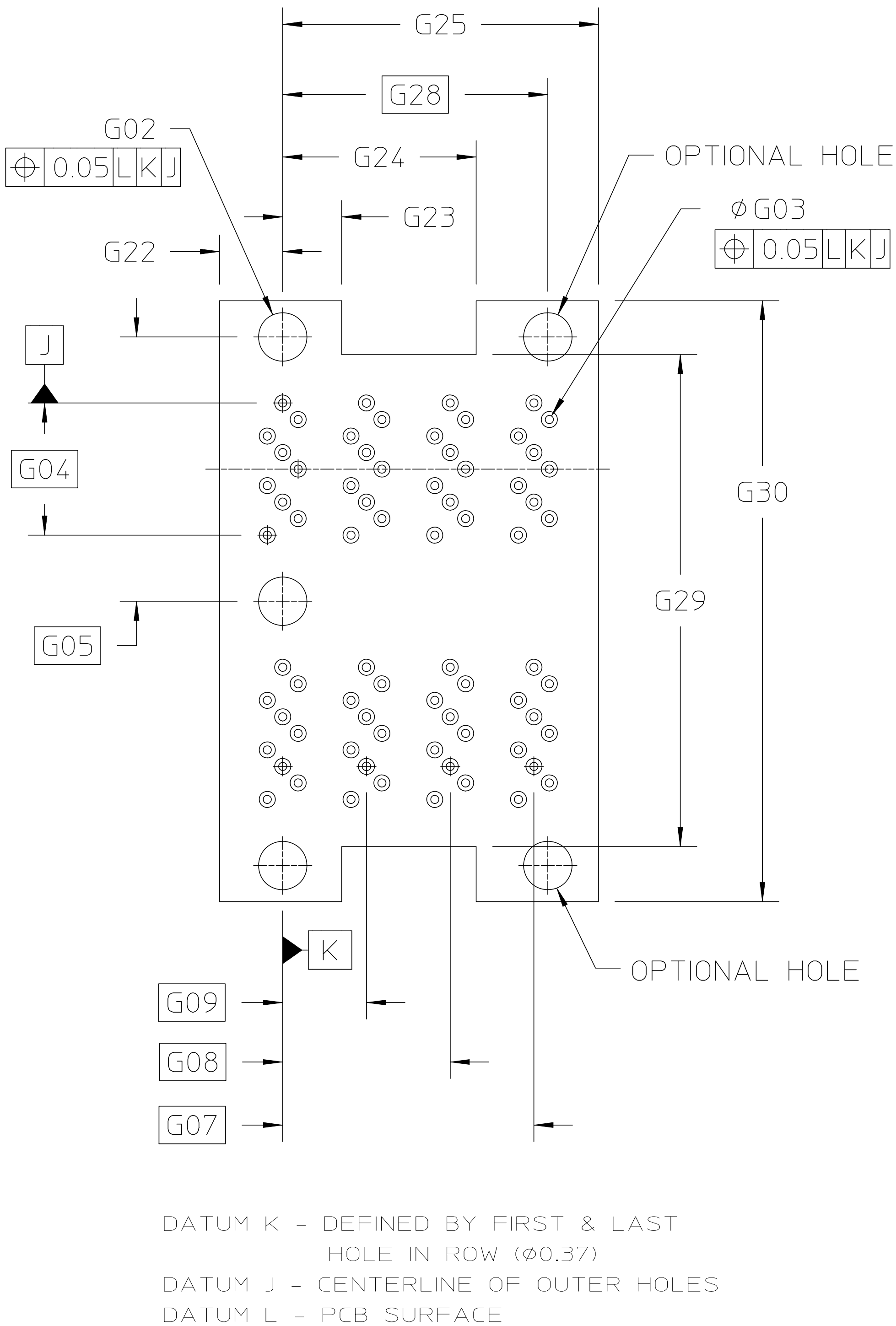


FIGURE 6-12 1X2 VERTICAL UNITARY RECEPTACLE FOOTPRINT

TABLE 6-5 RECEPTACLE FOOTPRINT DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
G01(*)	Datum to Front Edge of PCB	8.75	Min
G02	1-x-n Mounting Hole Diameter	2.20	0.10
G03	1-x-n Receptacle (Finished PTH) Hole Diameter	0.37	0.05
G04	1-x-n Receptacle Pin, Center to Center	6.00	Basic
G05	1-x-n Mounting Hole to Mounting Hole	12.00	Basic
G06	1-x-n RA Datum K to Mounting Hole	1.45	Basic
G07	1-x-n Datum K to Fourth Group	11.40	Basic
G08	1-x-n Datum K to Third Group	7.60	Basic
G09	1-xx Datum K to Second Group	3.80	Basic
G10	1-x-n Receptacle Hole to Hole within Group	0.75	Basic
G11	1-x-n Receptacle Hole to Hole within Group	1.50	Basic
G12	1-x-n Receptacle Hole to Hole within Group	2.25	Basic
G13	1-x-n Receptacle Hole to Hole within Group	0.70	Basic
G14	1-x-n Receptacle Hole to Hole within Group	1.40	Basic
G15	RA Connector Keep Out Area	10.25	Min
G16	RA Connector Keep Out Area	15.66	Min
G17	RA Connector Keep Out Area	12.85	Min
G18	RA Connector Keep Out Area	2.65	Min
G19	RA Connector Keep Out Area	2.66	Min
G20	RA Connector Keep Out Area	15.19	Min
G21	Connector Keep Out Area	3.77	Min
G22	1-x-n VT Connector Keep Out Area	2.87	Min
G23	1-x-n VT Connector Keep Out Area	2.68	Min
G24	1-x-n VT Connector Keep Out Area	8.78	Max
G25	1-x-n VT Connector Keep Out Area	14.33	Min
G26	VT Connector Keep Out Area	10.34	Min
G27	VT Connector Keep Out Area	15.29	Min
G28	Optional Mounting Hole	12.03	Basic
G29	1-x-2 VT Connector Keep Out Area	22.34	Min
G30	1-x-2 VT Connector Keep Out Area	27.29	Min
* Dimension to front edge of PCB must be maintained to ensure the Plug cannot be reverse mated with the Right Angle Receptacle.			

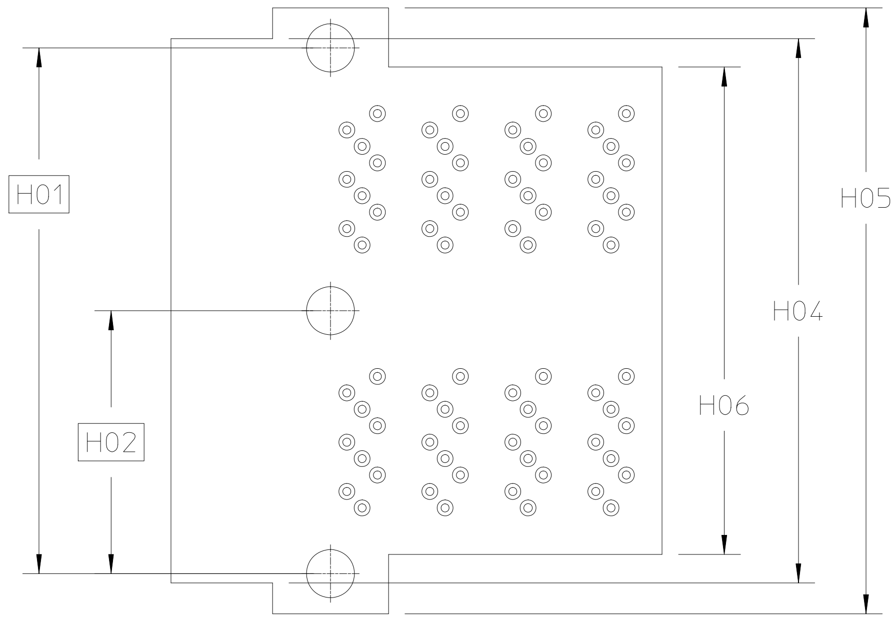


FIGURE 6-13 1X2 RIGHT ANGLE RECEPTACLE FOOTPRINT

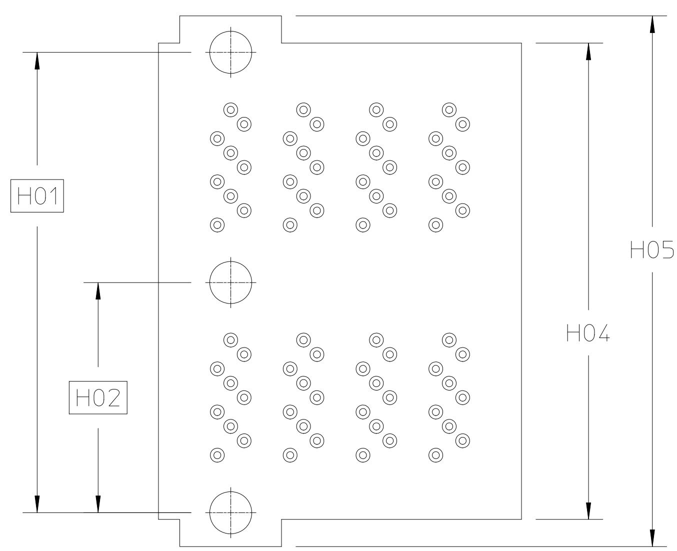


FIGURE 6-14 1X2 VERTICAL MODULAR RECEPTACLE FOOTPRINT

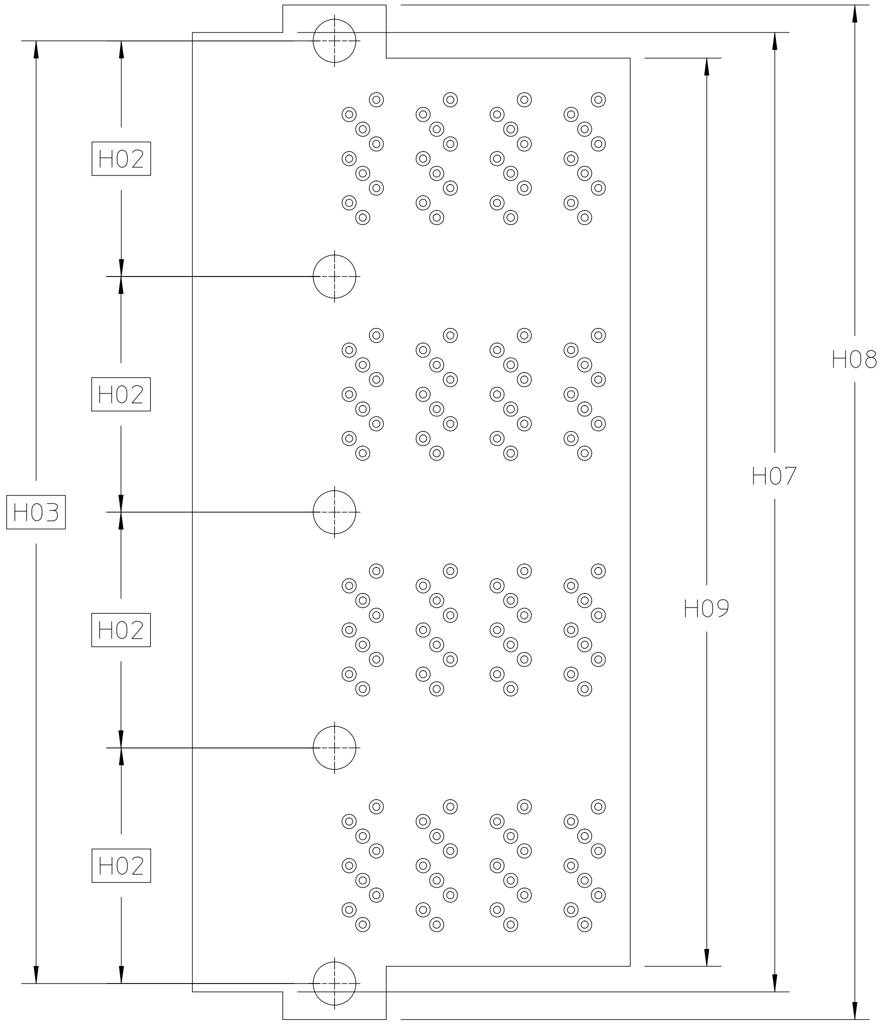


FIGURE 6-15 1X4 RIGHT ANGLE RECEPTACLE FOOTPRINT

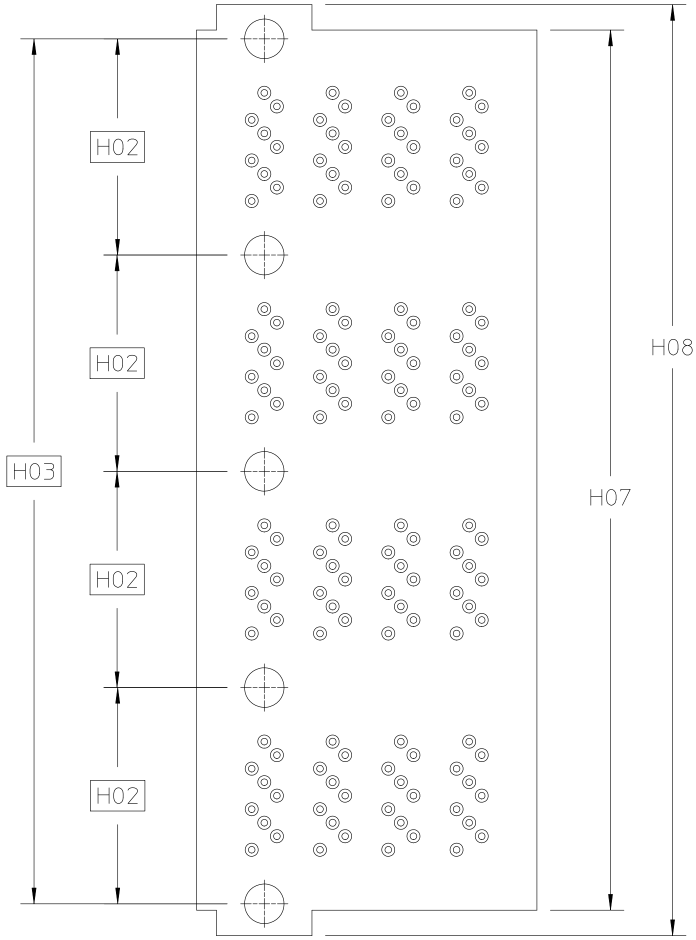


FIGURE 6-16 1X4 VERTICAL MODULAR RECEPTACLE FOOTPRINT

TABLE 6-6 RECEPTACLE KEEP-OUT AREA DIMENSIONS

Designator	Description	Dimension	Tolerance +/-
H01	1x2 Mounting Hole to Hole	24.00	Basic
H02	Port to Port Spacing	12.00	Basic
H03	1x4 Mounting Hole to Hole	48.00	Basic
H04	Connector Keep Out Area	24.85	Min
H05	Connector Keep Out Area	27.66	Min
H06	Connector Keep Out Area	22.25	Min
H07	Connector Keep Out Area	48.85	Min
H08	Connector Keep Out Area	51.66	Min
H09	Connector Keep Out Area	46.25	Min

7 Performance Requirements

This specification conforms to the test sequences as defined in EIA-364 TS-1000.

TABLE 7-1 TS-1000 REQUIREMENTS

Description	Requirement
Rated Durability Cycles	250
Field Life (3, 5, 7, or 10 years)	10 year
Field Temperature (57, 60, 65, 75, or 85C)	65C degrees
Test Group 4 Option	1B
Plating Type (Precious / non-Precious)	Precious
Surface Treatment (Lubricated or non-Lubricated)	Manufacturer to specify

TABLE 7-2 ELECTRICAL REQUIREMENTS

Description	Requirement	Procedure
Current	0.5 A per contact	
Voltage	30 VDC per contact	
Low Level Contact Resistance	Baseline	EIA 364-23 20 mVDC, 10 mA
Insulation Resistance	1000 Megaohms minimum between adjacent contacts	100 VDC
Dielectric Withstanding Voltage	No defect or breakdown between adjacent contacts	300 VDC minimum for 1 minute

TABLE 7-3 MECHANICAL REQUIREMENTS

Description	Requirement	Procedure
Mating Force	150N maximum	EIA 364-13
Un-mating Force	50N maximum	EIA 364-13
Vibration	- No Damage - No discontinuity longer than 1 microsecond allowed. - 20 milliohms maximum change from initial (baseline) contact resistance	EIA 364-28
Mechanical Shock	- No Damage - 20 milliohms maximum change from initial (baseline) contact resistance	EIA 364-27

TABLE 7-4 ENVIRONMENTAL REQUIREMENTS

Description	Requirement	
Storage Temperature	-20C to +85C degrees	
Humidity	80 percent Relative Humidity	