

SFF Committee

**SFF-8200**

Specification for

**Suite of 2.5" Form Factor Drives**

Rev 3.3            January 16, 2016

**Standardized as EIA-720-A 2007/02**

This specification was Expired after being submitted as a project to the Electronic Industries Alliance as a consolidation of several specifications.

SFF-8201	2.2	2.5 inch Form Factor Drive Dimensions
SFF-8212	1.2	2.5 inch Form Factor w/SFF-8001 44-pin ATA Connector
SFF-8222	2.1	2.5 inch Drive w/SCA-2 Connector
SFF-8223	2.4	2.5 inch Drive w/Serial Attachment Connector

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

**Standardized as EIA-720-B 2016/01**

Some individual specifications Expired, some were new, and the editor had cause to generate revisions of others, the details of which are reflected in the Update History on the 'Expression of Support by Manufacturers' page.

SFF-8201	3.3	2.5 inch Form Factor Drive Dimensions
SFF-8212	1.4	2.5 inch Form Factor w/50-pin Connector
SFF-8222	2.3	2.5 inch Form Factor Drive w/SCA-2 Connector
SFF-8223	2.7	2.5 inch Form Factor Drive w/Serial Attached Connector
SFF-8248	1.0	2.5 inch Form Factor w/Combo Connector inc USB Micro-B Receptacle
SFF-8252	0.5	2.5 inch Form Factor Drive w/SFF-8784 Connector

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](mailto: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:

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

**EXPRESSION OF SUPPORT BY MANUFACTURERS**

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

All Best  
Foxconn  
HGST  
Luxshare-ICT  
Molex  
Sandisk  
Seagate  
Shenzhen  
TE Connectivity  
Toshiba  
Volex

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

Amphenol  
Applied Micro  
Broadcom  
FCI  
Finisar  
JDS Uniphase  
QLogic  
Sumitomo

## 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](http://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](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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SFF Committee documentation may be purchased in electronic form.  
SFF specifications are available at <ftp://ftp.seagate.com/sff>

SFF Committee

**SFF-8201**

Specification for

**2.5" Form Factor Drive Dimensions**

Rev 3.3

August 30 2014

Secretariat: SFF Committee

Abstract: This document defines the dimensions for 2.5" magnetic disk drives.

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.

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	Madison Cable
Adaptec	Maxtor
Cirrus Logic	Methode
Compaq	Molex
Conner Peripherals	Nexans
Dell Computer	Quantum
EMC	Robinson Nugent
ENDL	Sandisk
Fujitsu CPA	Seagate
HGST	Shenzhen
Hitachi Cable	Sigma
Honda Connector	Sun Microsystems
IBM	TE Connectivity
Integral Peripherals	Toshiba
Intel	Unisys
LSI	Western Digital
Luxshare-ICT	Xyratex

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

Amphenol	MGE
Avago	NetApp
Comax	Oclaro
DEC	Panduit
Emulex	Pioneer
FCI	QLogic
Finisar	Silicon Systems
Foxconn	Sumitomo
Hewlett Packard	Vitesse Semiconductor
Infineon	Volex
JDS Uniphase	

**Change History**

Rev 2.6 (July 18, 2012):

- Added 5.00 A1 dimension and associated text to make side mounting holes mandatory and bottom mounting holes optional.

Rev 2.7 (October 25, 2012):

- Changed < 7.00 mm to = 7.00 mm.

Rev 2.8 (January 9, 2013):

- Added height of 7.20 mm to Table 4-1.

Rev 2.9 (April 22 2013):

- Removed height of 7.20 mm from Table 4-1.
- Added note to require labeling of 7.20 mm drives.
- Changed note under Figures 4-1 and 4-2 to include 7.20 mm.
- Identified Figures 4-1, 4-2, and 4-3 to be replaced when redrawn without obsolete



mounting holes.

Rev 3.0 (May 24 2013)

- Remove note requiring the labeling of 7.20mm drives.

Rev 3.1 (July 8 2013)

- Replaced Figures 4-1, 4-2, and 4-3

Rev 3.2 (October 25, 2013)

- Corrected note on A1 7.0mm to read A2=0.20 mm (0.008")
- Notes under Figures 4-1, 4-2, 4-3 revised to read as 7 mm

Rev 3.3 (August 30, 2014)

- Editorial changes for consistency between specifications in revised EIA-720.

SFF Committee --

## 2.5" Form Factor Drive Dimensions

### 1. Scope of SFF-8201

This specification defines the dimensions of 2.5" disk drives.

#### 1.1 Application Environment

The environment for the 2.5" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment.

The purpose of this Specification is to provide information that will assist vendors to design products that can fit the same packaging envelope.

### 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 standards are relevant to many SFF Specifications.

- ASME Y14.5M      Dimensioning and Tolerancing

#### 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://www.techstreet.com/incitsgate.tmp1>).

#### 2.4 Conventions

The dimensioning conventions are described in ASME-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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:

**Obsolete:** Dimensions identified as obsolete are for reference and may apply to existing 2.5" form factor disk drives. New 2.5" form factor disk drives are to be designed to dimensions that are not identified as obsolete.

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

Specification. However, if any feature defined by the SFF Specification is implemented, it shall be done in the same way as defined by the Specification. Describing a feature as optional in the text is done to assist the reader. If there is a conflict between text and tables on a feature described as optional, the table shall be accepted as being correct.

### **3. General Description**

Table 3-1 specifies the dimensions for 2.5" disk drives and correlates them to the figures. Dimensions identified as obsolete are for reference and may apply to existing device features. New devices are to be designed to dimensions that are not identified as obsolete.

Figure 3-1 defines the dimensions for 2.5" disk drives and shows relationships among the dimensions.

Figure 3-2 contains detail views of the form factor.

Figure 3-3 defines the required mounting holes.

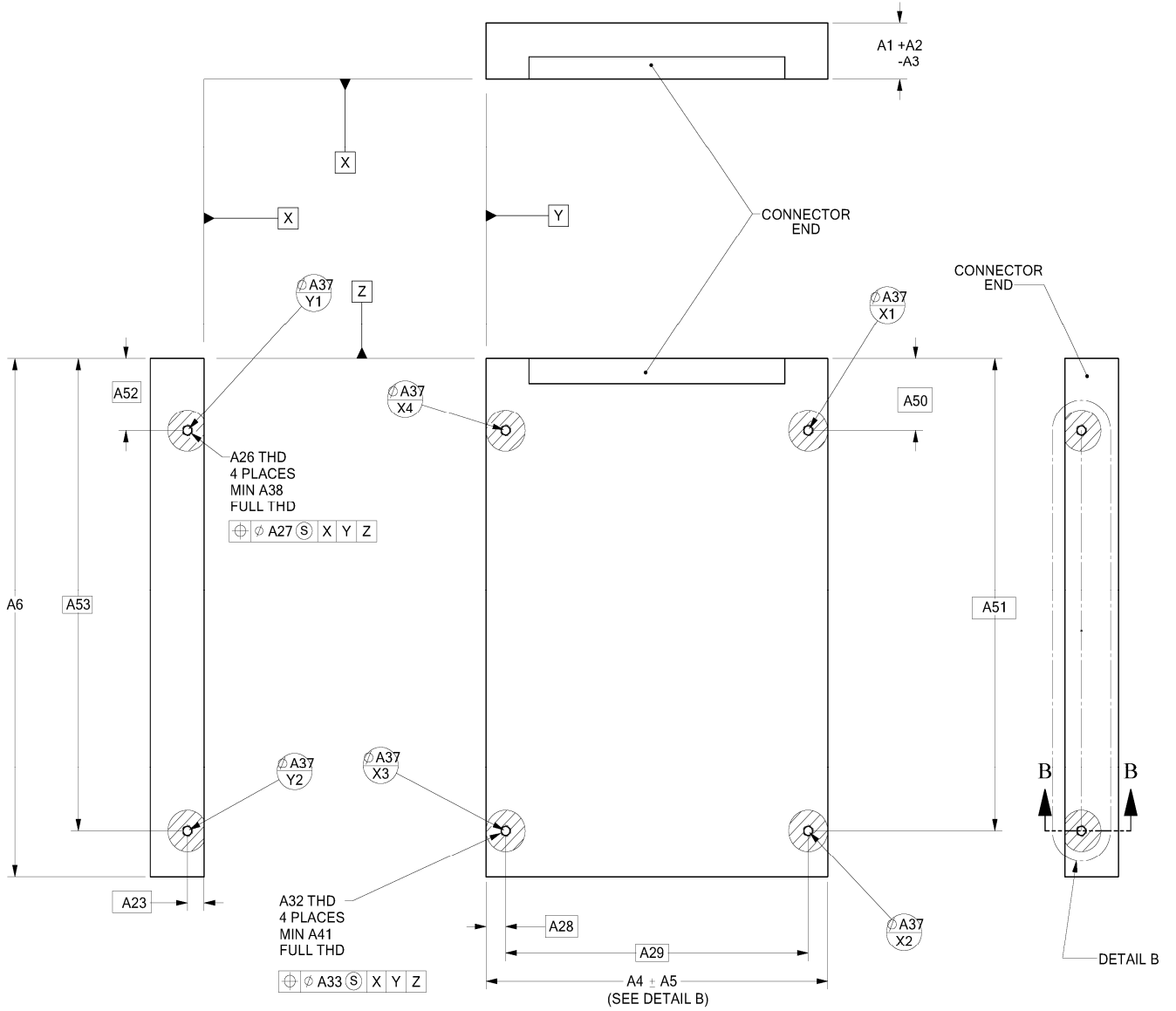
Figure 3-4 defines the length of the form factor and connector that complies with revision 2.0 or higher of this specification. See the referenced specification for connector location requirements.

TABLE 3-1 DISK DRIVE DIMENSIONS

Dimension		Millimeters	Inches	Comments
A 1		19.05	0.750	
A 1		17.00	0.669	
A 1		15.00	0.591	
A 1		12.70	0.500	
A 1		10.50	0.413	
A 1		9.50	0.374	A2=A3=0.20 mm
A 1		8.47	0.333	
A 1		7.00	0.276	A2=0.20 mm
A 1		5.00	0.197	A2=A3=0.20 mm
A 2		0.00	0.000	
A 3		0.50	0.020	
A 4		69.85	2.750	
A 5		0.25	0.010	
A 6	Max	101.85	4.010	Obsolete
A 6	Max	100.45	3.955	New requirement
A10		100.20	3.945	SFF-8212
A11		100.50	3.957	SFF-8223
A12		110.20	4.339	SFF-8222
A23		3.00	0.118	
A24		34.93	1.375	Obsolete
A25		38.10	1.500	Obsolete
A26		M3	N/A	
A27		0.50	0.020	
A28		4.07	0.160	
A29		61.72	2.430	
A30		34.93	1.375	Obsolete
A31		38.10	1.500	Obsolete
A33		0.50	0.020	
A37		8.00	0.315	
A50		14.00	0.551	
A51		90.60	3.567	
A52		14.00	0.551	
A53		90.60	3.567	
<b>Threads</b>				
A32		Size	M3	
A38	Min	Penetration	3	2 for A1 ≤ 7 mm
A41	Min	Penetration	2.5	

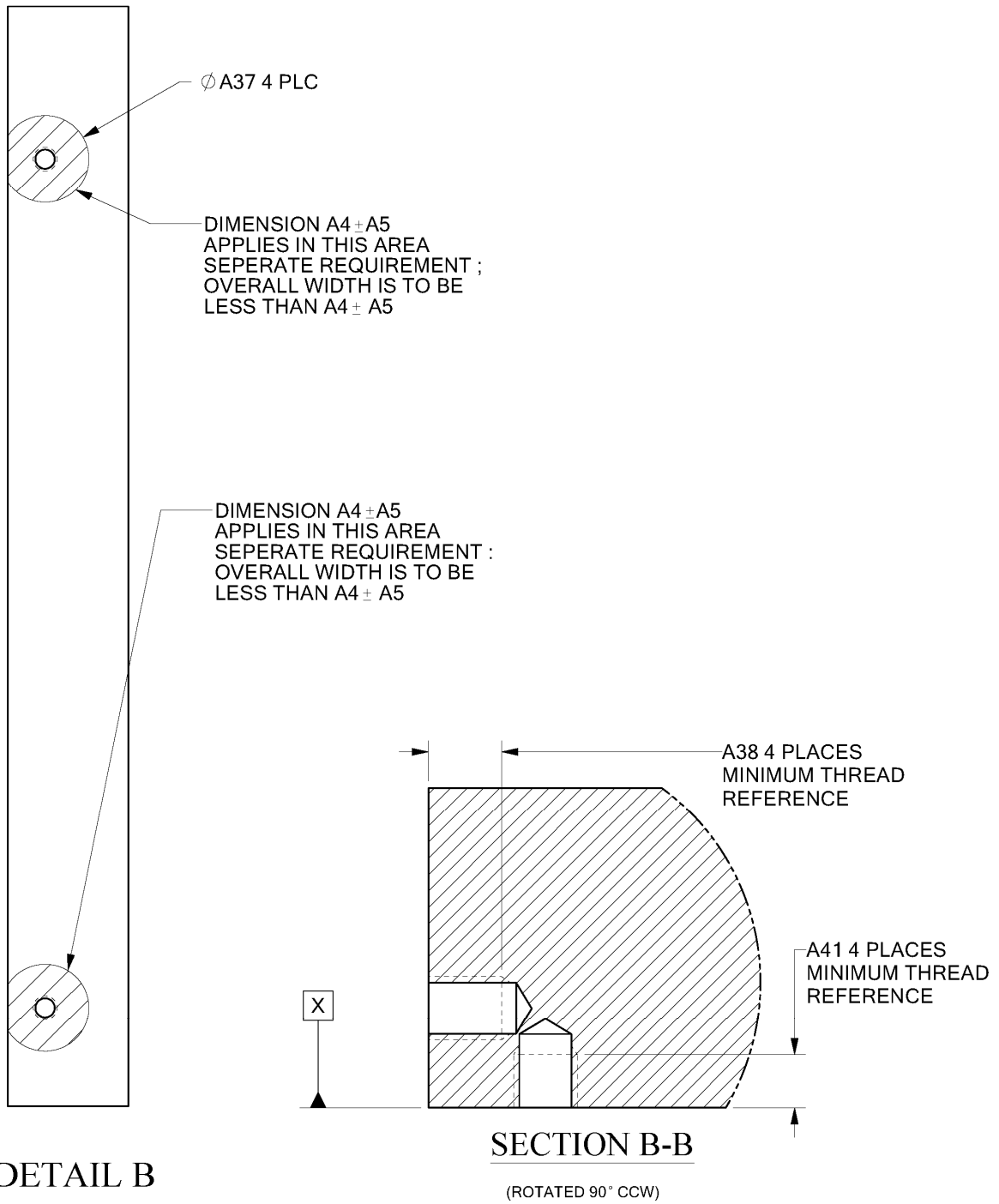
## NOTES:

1. (A4+A5) represents the maximum width of the drive, 70.10 mm.
2. Dimensions A10, A11, and A12 are based on a nominal form factor length of 100.20 mm.
3. Unless diameter targets indicate specific areas, dimensions for a surface apply to a single point minimum. If a surface is not flat, the dimension applies to the highest raised location on that surface.
4. Information in Comments column take precedence over the stated dimensions.

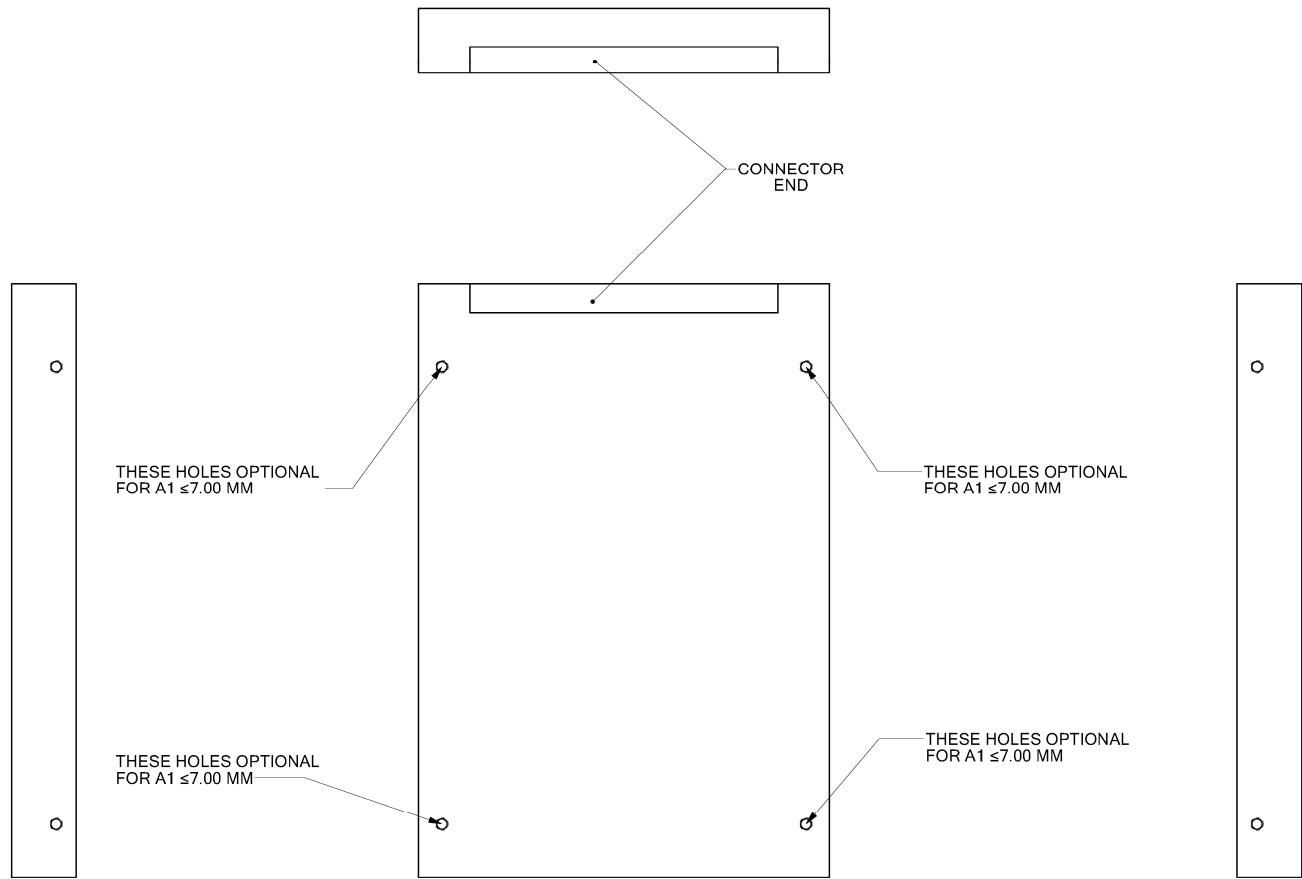


Note: Bottom mounting holes are optional on form factors with  $A1 \leq 7$  mm

**FIGURE 3-1 FORM FACTOR OF 2.5" DISK DRIVE**

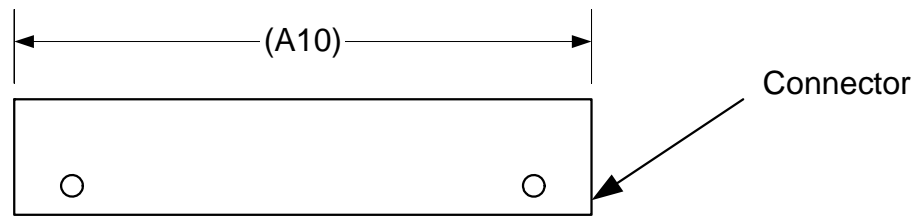


Note: Bottom mounting holes are optional on form factors with  $A1 \leq 7$  mm  
**FIGURE 3-2 DETAIL VIEWS OF 2.5" DISK DRIVE FORM FACTOR**

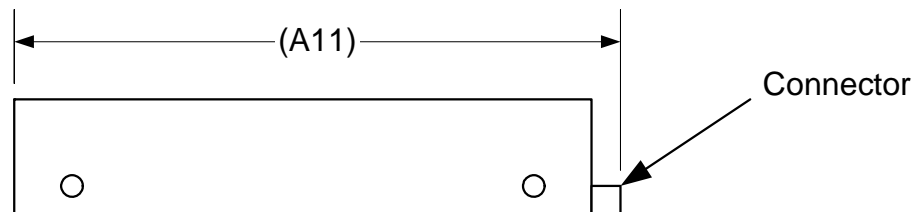


Note: Bottom mounting holes are optional on form factors with A1 ≤ 7 mm

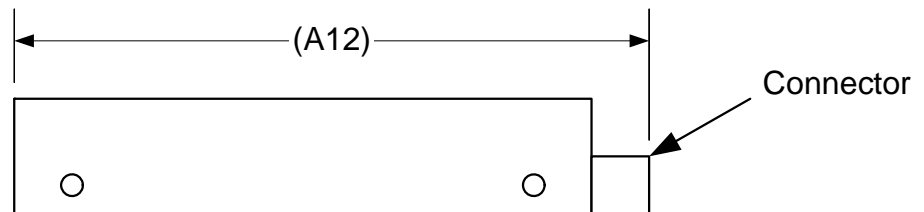
**FIGURE 3-3 REQUIRED MOUNTING HOLES OF 2.5" DISK DRIVE**



Form factor overall length with 50-pin connector  
Ref. SFF-8212



Form factor overall length with Serial ATA or Serial Attached SCSI connector  
Ref. SFF-8223



Form factor overall length with SCA-2 connector  
Ref. SFF-8222

FIGURE 3-4 LENGTH OF 2.5" DISK DRIVE WITH CONNECTOR



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

SFF Committee

**SFF-8212**

Specification for

**2.5" Form Factor Drive with 50-pin Connector**

Rev 1.4

August 30 2014

Secretariat: SFF Committee

**Abstract:** This specification defines the 50-pin ATA connector mounting position on 2.5" magnetic disk drives.

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.

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

**POINTS OF CONTACT:**

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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  
Adaptec  
AMP  
Cirrus Logic  
Conner Peripherals  
ENDL  
Hewlett Packard  
Honda Connector  
IBM  
Integral Peripherals  
Madison Cable  
Maxtor  
Methode  
Quantum  
Robinson Nugent  
Seagate  
Sigmax

The following member companies of the SFF Committee voted to forward this industry specification to an accredited standards body.

IBM  
Integral Peripherals  
Methode

**Update History**

Rev 1.3 (February 10, 2014)

- Rev 1.2 July 1995 contents incorporated in current template.

Rev 1.4 (August 30, 2014)

- Editorial changes for consistency between specifications in revised EIA-720.

SFF Committee --

## 2.5" Form Factor Drive with 50-pin Connector

### 4. Scope of SFF-8212

This specification defines the dimensions and tolerances for location of the 50-pin ATA connector on SFF-8201 compliant 2.5" form factor drives.

#### 4.1 Application Environment

The environment for the 2.5" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment.

The purpose of this Specification is to provide information that will assist vendors to design products that can fit the same packaging envelope.

### 5. References

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

#### 5.1 Industry Documents

The following standards are relevant to many SFF Specifications.

- ASME Y14.5M            Dimensioning and Tolerancing
- X3.131R-1994        SCSI-2 Small Computer System Interface
- X3T9.2/0855         SPI (SCSI-3 Parallel Interface)
- X3.221-199x         ATA (AT Attachment)
- X3T10/0948         ATA-2 (ATA Extensions)

#### 5.2 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>

#### 5.3 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://www.techstreet.com/incitsgate.tmp1>).

#### 5.4 Conventions

The dimensioning conventions are described in ASME-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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

## 6. General Description

### 6.1 Mounting Considerations

This specification defines the dimensions of a disk drive to be inserted into a cavity in a portable computer. The dimensions and tolerances are intended to be an aid for system designers as well as disk drive designers.

The connector configuration permits the same drive to be used in a cabled application. Drives designed for use in cabled applications need not conform to all the dimensions and tolerances specified in this document e.g. if the connector was mounted in a vertical orientation it could require the PCB to be longer (thereby increasing the overall length of the drive).

### 6.2 Physical Location of Connector

The table contains the dimensions represented in the figure, which defines the location of the 50-pin connector on 2.5" disk drives.

**TABLE 6-1 50-PIN CONNECTOR LOCATION**

Dimension		Millimeters	Inches
A 7		31.17	1.227
A 8		1.00	0.039
A 9		3.99	0.157
A10		10.14	0.399
A11		2.00	0.079
A12		2.00	0.079
A13		0.50	0.020
A14		0.05	0.002
A15		0.75	0.030
A16		0.10	0.004
A17		0.50	0.020
A18		0.05	0.002
A19		0.50	0.020
A20		0.10	0.004
A21		3.86	0.152
A22		0.20	0.008
A34	Min	1.00	0.039
A35	Max	8.00	0.315
A36	Min	60.20	2.370
A39	Min	1.25	0.049
A40	Min	0.25	0.010
A54		10.24	0.403

- Notes: a) X, Y and Z Datums are as defined by SFF-8201.  
 b) A15 and A19 control the location of the connector as a whole.  
 c) A16 and A20 control the location of the pins within the connector.

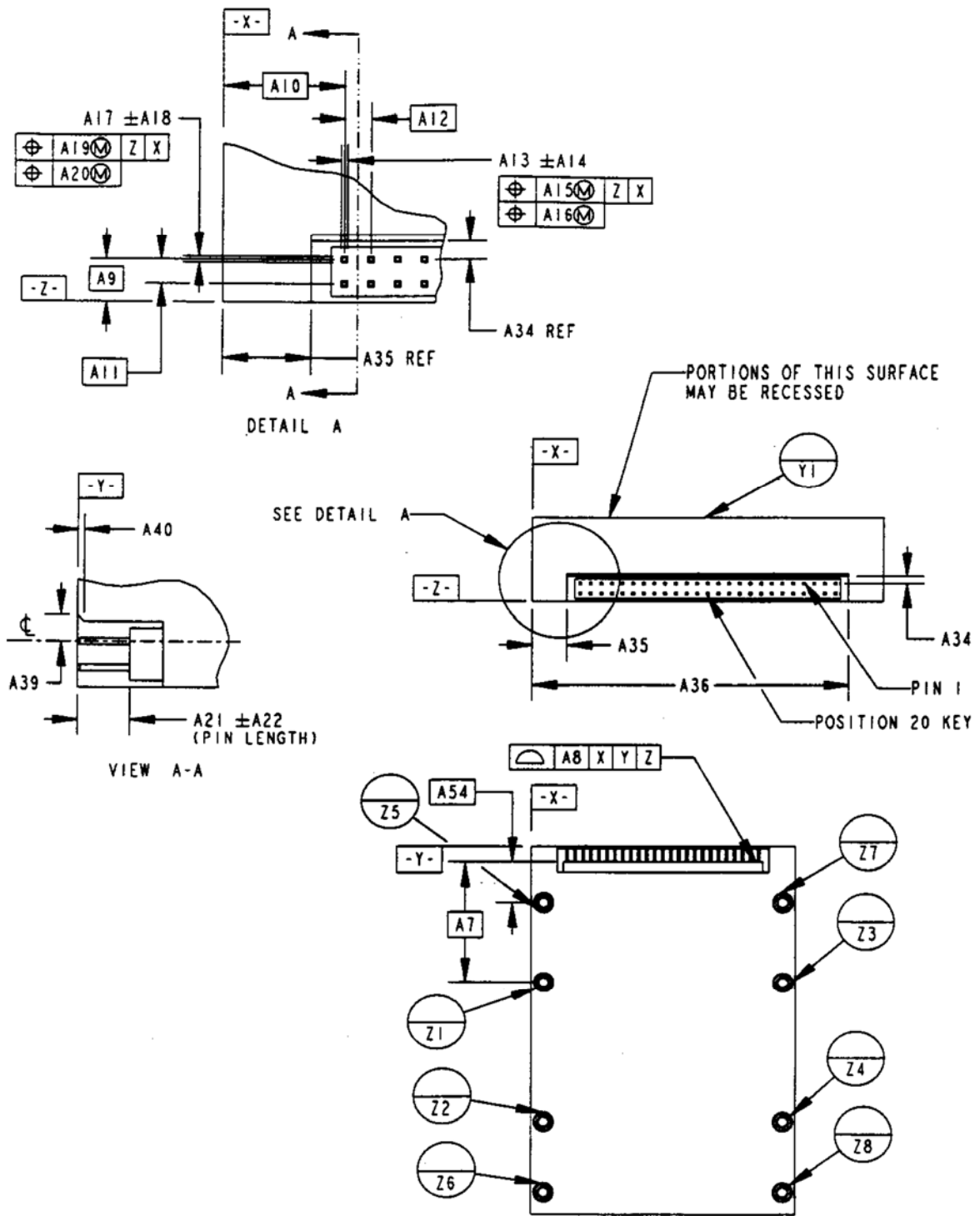


FIGURE 6-1 50-PIN CONNECTOR ON 2.5" DISK DRIVE

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-8222**

Specification for

**2.5" Form Factor Drive with SCA-2 Connector**

Rev 2.3      August 30 2014

Secretariat: SFF Committee

**Abstract:** This specification defines the requirements for the location of the SCA-2 connector on the 2.5" Drive Form Factors. Dimensions are referenced either from the form factor bottom mounting hole or the form factor side mounting hole, depending on the application.

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.

**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.

Adaptec  
ENDL  
FCI/Berg  
Foxconn Int'l  
Fujitsu CPA  
Hewlett Packard  
Hitachi Cable  
Hitachi GST  
IBM  
Intel  
Madison Cable  
Molex  
Nexans  
Seagate  
Sun Microsystems  
Toshiba America  
Tyco AMP  
Unisys  
Xyratex

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

Agilent  
Amphenol  
Dell  
EMC  
Fujitsu Compnts  
Hitachi America  
Infineon  
Maxtor  
Micrel  
Picolight  
Vitesse Semi

**Change History**

2.2 Rev (February 12, 2014)

- Rev 2.1 July 2004 contents incorporated in current template.

Rev 2.3 (August 30, 2014)

- Editorial changes for consistency between specifications in revised EIA-720.

SFF Committee --

## 2.5" Form Factor Drive w/SCA-2 Connector

### 7. Scope of 8222

This specification defines the dimensions and tolerances for location of the SCA-2 connector on SFF-8201 compliant 2.5" form factor drives.

#### 7.1 Application Environment

The environment for the 2.5" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment.

The purpose of this Specification is to provide information that will assist vendors to design products that can fit the same packaging envelope.

### 8. References

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

#### 8.1 Industry Documents

The following standards are relevant to many SFF Specifications.

- ASME Y14.5M      Dimensioning and Tolerancing
- 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)
- X3.230-199x    FC-PH Physical Interface
- X3T11/0960    FC-AL Arbitrated Loop
- X3T10/0993    FCP Fibre Channel Protocol (X3T11 FC-PH)
- EIA PN-3651    Detail Specification for Trapezoidal Connector 0.50" Pitch used with Single Connector Attach -2.
- EIA-720        Detail, SFF 2.5" Disk Drives
- SFF-8201       Form Factor of 2.5" Disk Drives

#### 8.2 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>

#### 8.3 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://www.techstreet.com/incitsgate.tmp>).

#### 8.4 Conventions

The dimensioning conventions are described in ASME-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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

## 9. General Description

This specification defines the location of the SCA-2 (Single Connector Attach) interface connectors for parallel SCSI (80-pin) and Fibre Channel (40-pin) on the 2.5" Drive Form Factors.

This specification defines requirements for a drive that can be directly inserted into the backplane of a cabinet, without the need for a cable, and provides information necessary to assist manufacturers in the systems integration of small form factor disk drives. This specification allows only one location for the interface connector on the drive for any specific application. In Application Option 1 where bottom mounting is used, the bottom mounting hole provides the reference for dimensions. In Application Option 2 where side mounting is used, the side mounting hole provides the reference for dimensions. A drive may comply with both options but the systems application must choose either Option 1 or Option 2.

This specification methodology prevents excessive tolerance stack-up between the two mounting screw locations when the connector is referenced to only one mounting screw location and the form factor drawing is used to determine the location of the connector to the other mounting screw location.

Provision exists in the SCA-2 connector for improved mating via guides that incorporate provision for mating ground prior to mating any other signals.

Care must be taken in the application of this drive so that excessive stress is not exerted on the connector. Backplane configurations must pay particular attention so that the connector is not damaged due to excessive side loading, compressive forces, or from supporting the weight of the device.

Table 9-1 defines the dimensions associated with the positioning of the connector on the drive as illustrated in Figure 9-1 or Figure 9-2.

**TABLE 9-1 SCA-2 CONNECTOR LOCATION**

Dimension	Millimeters		Comments
A 1	69.85	2.750	
A 2	66.50	2.618	80-position
A 2	41.10	1.618	40-position
A 3	1.00	0.039	
A 4	0.35	0.014	
A 5	7.00	0.276	
A 6	1.00	0.039	
A 7	4.00	0.157	
A 8	24.00	0.945	
A 9	0.35	0.014	
A10	0.50	0.020	

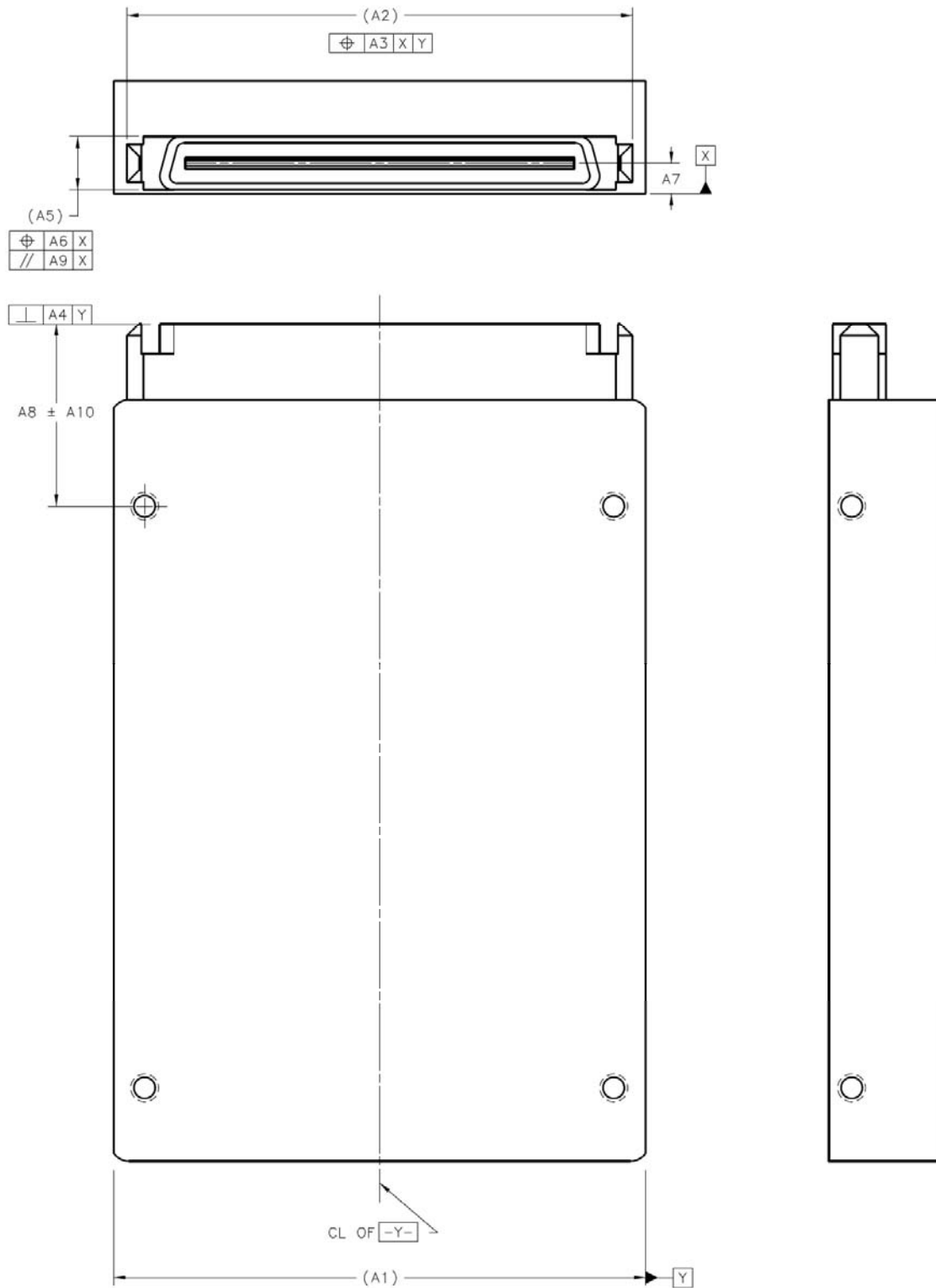
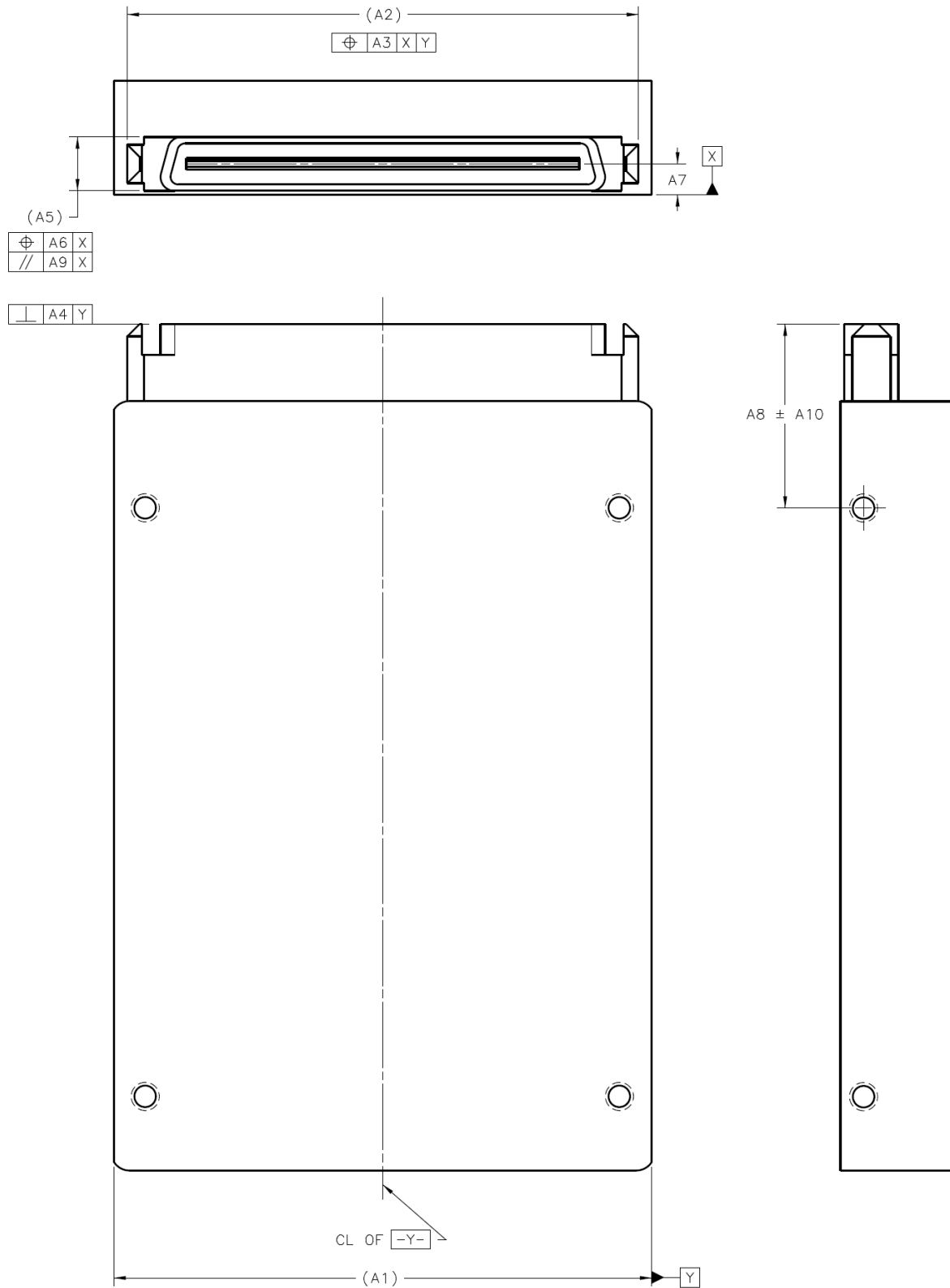


FIGURE 9-1 APPLICATION OPTION 1: 2.5" DRIVE FORM FACTOR WITH SCA-2 CONNECTOR REFERENCED TO BOTTOM MOUNTING SCREW



**FIGURE 9-2 APPLICATION OPTION 2: 2.5" DRIVE FORM FACTOR WITH SCA-2 CONNECTOR REFERENCED TO SIDE MOUNTING SCREW**

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

SFF Committee

**SFF-8223**

Specification for

**2.5" Form Factor Drive with Serial Attached Connector**

Rev 2.7      August 30 2014

Secretariat: SFF Committee

**Abstract:** This specification defines the dimensions for location of the serial connector on the 2.5" Drive Form Factors for Serial Attached SCSI (SAS) applications. The location is similar to that of the Serial ATA (SATA) connector location such that a backplane with a SAS receptacle connector may accept either a SAS or SATA drive. Dimensions are referenced either from the form factor bottom mounting hole or the form factor side mounting hole, depending on the application. Additional information concerning Serial ATA may be found at [www.serialata.org](http://www.serialata.org).

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.

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

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

Ph: 408-867-6630  
endlcom at acm dot org

**EXPRESSION OF SUPPORT BY MANUFACTURERS**

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

Amphenol  
Comax  
EMC  
ENDL  
FCI  
Foxconn  
Fujitsu CPA  
Hitachi GST  
Honda Connector  
LSI Logic  
Madison Cable  
Seagate  
Sun Microsystems  
Unisys  
Xyratex

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

Hitachi America  
IBM  
Maxtor

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

Clariphy  
Fujitsu Components  
Genum  
Hewlett Packard  
Hitachi Cable  
Infineon  
Intel  
Molex  
Nexans  
Picolight  
Sumitomo  
Toshiba America  
Tyco AMP  
Vitesse Semiconductor

**Change History**

Rev 2.5 (May 25, 2006)

- Deleted A21-A24 and Figure 5-3 when SFF-8221 Pre-Aligned 2.5" Drive >10mm Form Factor Expired.

Rev 2.6 (February 12, 2014)

- Rev 2.5 contents incorporated in current template.

Rev 2.7 (August 30, 2014)

- Editorial changes for consistency between specifications in revised EIA-720.

SFF Committee --

## 2.5" Form Factor Drive w/Serial Attached Connector

### 10. Scope of 8223

This specification defines the dimensions and tolerances for location of the serial connector on SFF-8201 compliant 2.5" form factor drives for Serial Attached SCSI (SAS) applications.

#### 10.1 Application Environment

The environment for the 2.5" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment.

The purpose of this Specification is to provide information that will assist vendors to design products that can fit the same packaging envelope.

### 11. References

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

#### 11.1 Industry Documents

The following standards are relevant to many SFF Specifications.

- ASME Y14.5M      Dimensioning and Tolerancing
- INCITS.376      Serial Attached SCSI (SAS)
- T10 1601-D      Serial Attached SCSI - 1.1 (SAS-1.1)
- SFF-8482      Dual Port Unshielded Serial Attachment Connector
- EIA-720      Detail, SFF 2.5" Disk Drives
- SFF-8201      Form Factor of 2.5" Disk Drives
- SFF-8482      Dual Port Unshielded Serial Attachment Connector
- SFF-8630      Serial Attachment 12 Gb/s 4X Unshielded Connector
- SFF-8639      Multifunction 12 Gb/s 6X Unshielded Connector
- SFF-8680      Serial Attachment 12 Gb/s 2X Unshielded Connector

#### 11.2 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>

#### 11.3 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://www.techstreet.com/incitsgate.tmp1>).

#### 11.4 Conventions

The dimensioning conventions are described in ASME-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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

## 12. General Description

SFF-8223 defines the location of the serial interface connector on the 2.5" Drive Form Factors for Serial Attached SCSI (SAS) applications. The connector nominally protrudes 0.3 mm (0.012") beyond the drive form factor connector end.

This specification defines a drive that can be directly inserted into the backplane of a cabinet, without the need for a cable, and provides information necessary to assist manufacturers in the systems integration of small form factor disk drives. Alternately, a cable may be used to supply power and to connect to the data port(s) of the drive. This specification allows only one location for the interface connector on the drive. The location is similar to that of the Serial ATA (SATA) connector location such that a backplane with a SAS receptacle connector may accept either a SAS or SATA drive. Additional information concerning Serial ATA may be found at [www.serialata.org](http://www.serialata.org).

Provision exists in the serial connector for improved mating via guides. Staggered pin lengths incorporate provision for mating ground prior to mating any other signals.

Care must be taken in the application of this drive so that excessive stress is not exerted on the connector. Backplane configurations must pay particular attention so that the connector is not damaged due to excessive side loading, compressive forces, or from supporting the weight of the device.

For a drive that can be directly inserted into the backplane of a cabinet this specification references dimensions for Option 1, the form factor bottom mounting hole or Option 2, the form factor side mounting hole. The optional approach prevents excessive tolerance stack-up between the two mounting screw locations when the connector is referenced to only one of the mounting screw locations. A drive may comply with both options but the systems application must choose either Option 1 or Option 2.

TABLE 12-1 SERIAL CONNECTOR LOCATION

Dimension	Millimeters	Inches
A 1	69.85	2.750
A 2	42.73	1.682
A 3	33.39	1.315
A 4	0.40	0.016
A 5	4.00	0.157
A 6	0.76	0.030
A 7	3.50	0.138
A 8	9.40	0.370
A 9	0.25	0.010
A10	1.00	0.039
A11	4.80	0.189
A12	0.38	0.015
A13	13.43	0.529
A14	37.20	1.465
A15	1.50	0.059
A16	1.00	0.039
A17	1.00	0.039
A18	0.30	0.012
A19	1.00	0.039
A20	0.50	0.020



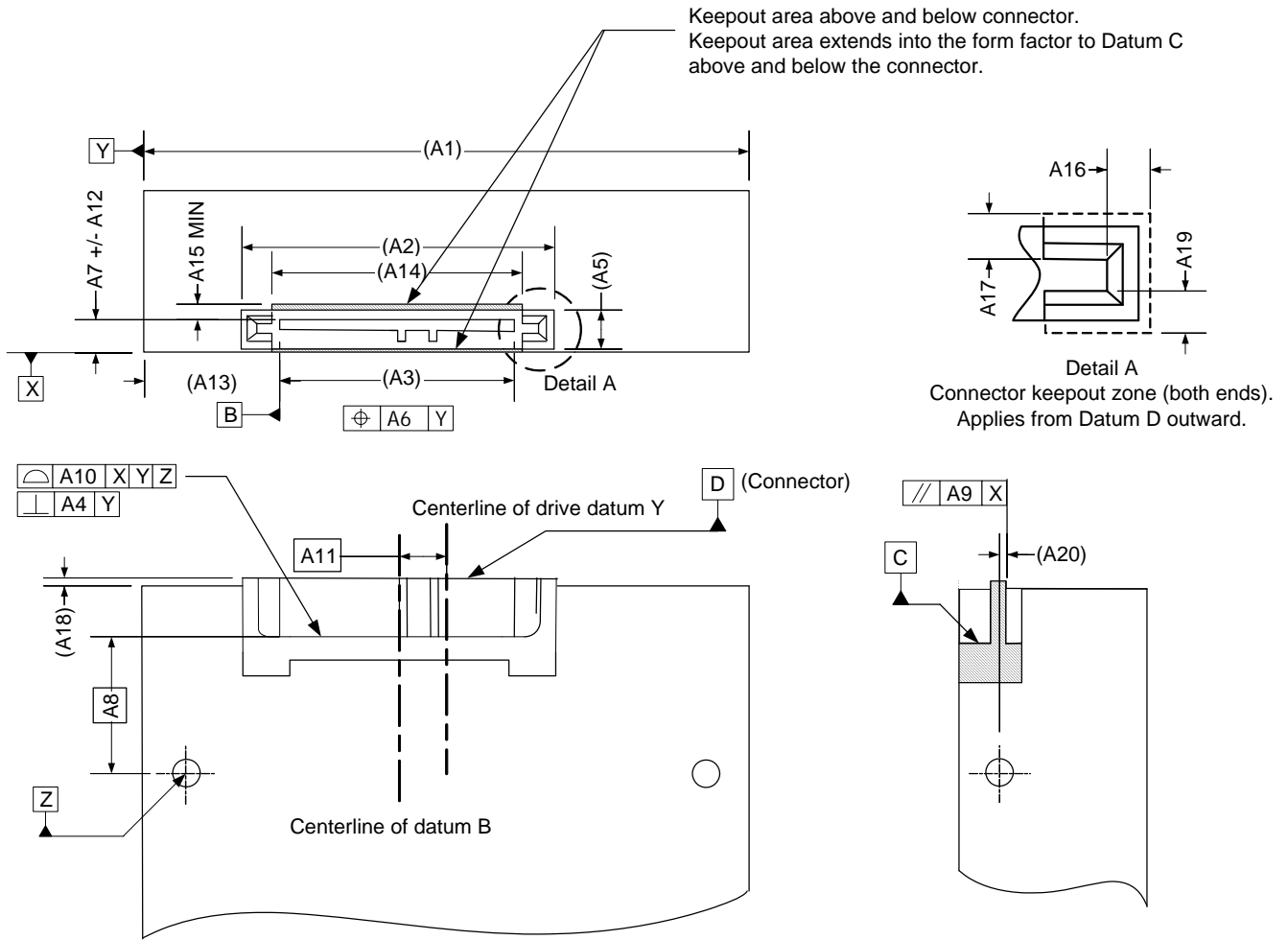


FIGURE 12-1 OPTION 1: 2.5" DRIVE FORM FACTOR WITH SERIAL CONNECTOR REFERENCED TO BOTTOM MOUNTING SCREW

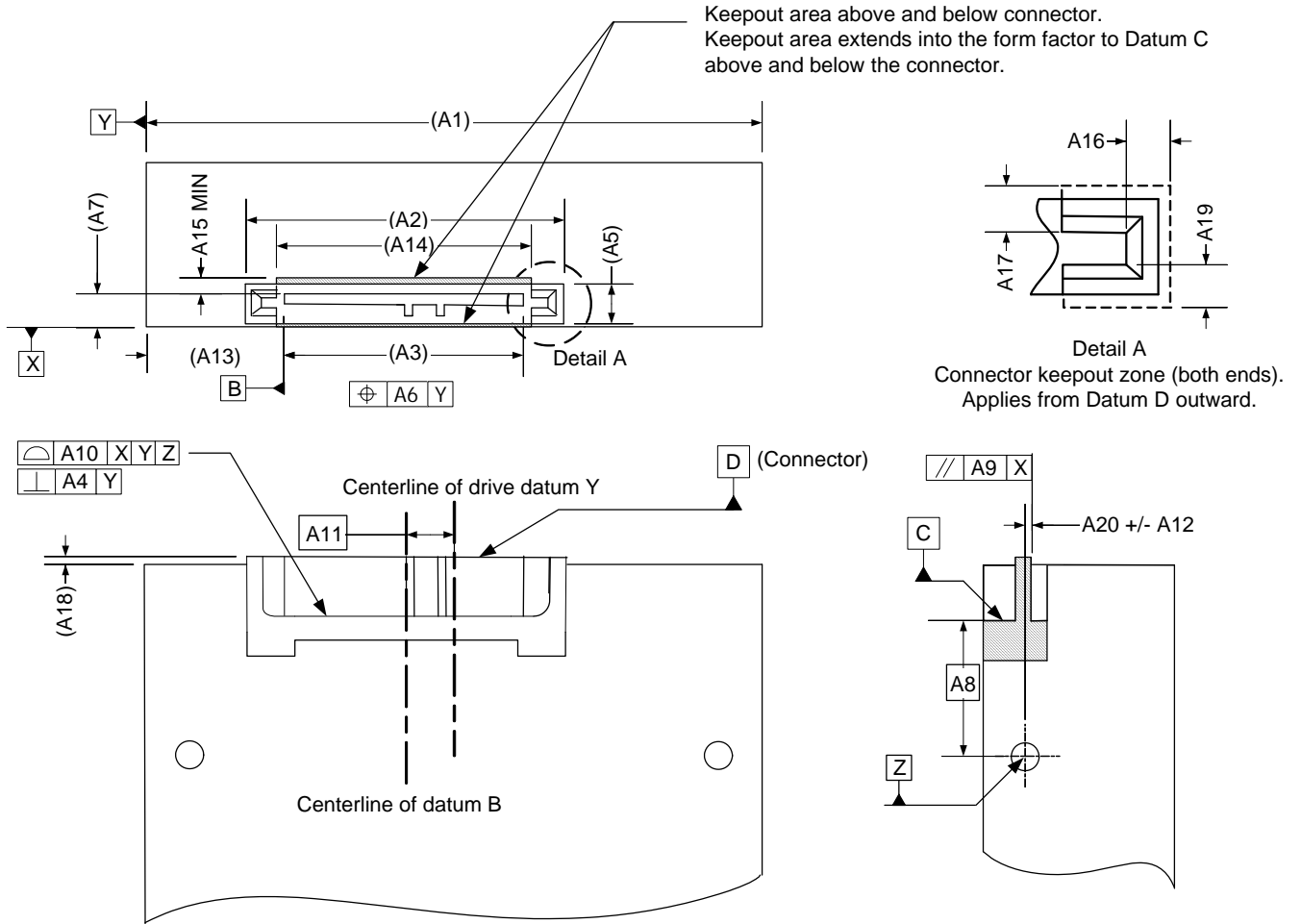


FIGURE 12-2 OPTION 2: 2.5" DRIVE FORM FACTOR WITH SERIAL CONNECTOR REFERENCED TO SIDE MOUNTING SCREW

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-8248**

Specification for

**2.5" Form Factor w/Combo Connector inc USB Micro-B Receptacle**

Rev 1.0

August 30 2014

Secretariat: SFF Committee

**Abstract:** This specification defines the dimensions for location of the combination connector including a USB 3.0 Micro-B receptacle on the 2.5" Drive Form Factor.

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.

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

**POINTS OF CONTACT:**

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## EXPRESSION OF SUPPORT BY MANUFACTURERS

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

Cinch  
EMC  
FCI  
Foxconn  
Hitachi GST  
Seagate  
Volex

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

Finisar  
LSI  
Molex  
NetApp  
NetLogic uSyst  
Sandisk  
Toshiba  
Tyco

**Update History**

Rev 0.5 (September 15, 2010)

- Updated the table entries as indicated in red text (A3, A11, A21, and A22) and replaced all figures.
- The reference to the mounting hole and the USB connector moved to the top of the tongue to the bottom.
- The dimensioning of the power section to USB section was revised.

Rev 0.6 (October 12, 2010)

- Updated figures to remove USB 3.0 connector protrusion.
- Deleted A22 dimension and changed A15.

Rev 0.8 (January 6, 2011)

- Changed connector name to "combination connector including a USB 3.0 Micro-B receptacle" and made minor editorial changes to text.

Rev 0.9 (February 12, 2014)

- Editorial update for forwarding to EIA.

Rev 1.0 (August 30, 2014)

- Editorial changes for consistency between specifications in revised EIA-720.

SFF Committee --

## 2.5" Form Factor w/Combo Connector inc USB Micro-B Receptacle

### 13. Scope of 8248

This specification defines the dimensions and tolerances for location of the combination connector including a USB 3.0 Micro-B receptacle on SFF-8201 compliant 2.5" form factor drives.

#### 13.1 Application Specific Criteria

The environment for the 2.5" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment.

The combination connector including a USB 3.0 Micro-B receptacle provides blind mate features plus extra power and feature pins on an additional connector section that is similar to the SATA connector power section. The drive may be used with a special backplane connector that allows support of an enhanced feature set. Alternately, it may be used with a USB cable having a Micro-B plug (and a standard SATA power cable, if required), although this configuration does not provide connections for the enhanced feature set.

The connector nominally protrudes 0.3 mm (0.012") beyond the drive form factor connector end.

### 14. References

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

#### 14.1 Industry Documents

The following standards are relevant to this specification:

- ASME Y14.5M      Dimensioning and Tolerancing
- Universal Serial Bus 3.0 Specification
- Serial ATA Revision 3.0 (SATA), 2 June 2009
- SFF-8458        Combination Connector Including a USB 3.0 Micro-B Receptacle

#### 14.2 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>

#### 14.3 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 ([www.techstreet.com/incitsgate.html](http://www.techstreet.com/incitsgate.html)).

#### 14.4 Conventions

The dimensioning conventions are described in ASME-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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

## 15. General Description

SFF-8248 defines the location of the combination connector including a USB 3.0 Micro-B receptacle on the 2.5" Drive Form Factor. The connector nominally protrudes 0.3 mm (0.012") beyond the drive form factor connector end.

This specification defines a drive that can be directly inserted into the backplane of a cabinet, without the need for a cable, and provides information necessary to assist manufacturers in the systems integration of small form factor drives. Alternately, cables may be used to supply power and to connect to the data port(s) of the drive. This specification allows only one location for the interface connector on the drive. The location is similar to that of the Serial ATA (SATA) connector location such that migration to USB 3.0 may be done with minimal mechanical changes to the system. Additional contacts are added on the power connector on the opposite side of the standard SATA power pins so that a standard power cable may be used or enhanced features may be incorporated with the use of a backplane connector. See SFF-8458 for the Combination Connector Including a USB 3.0 Micro-B Receptacle mechanical and enhanced feature set details.

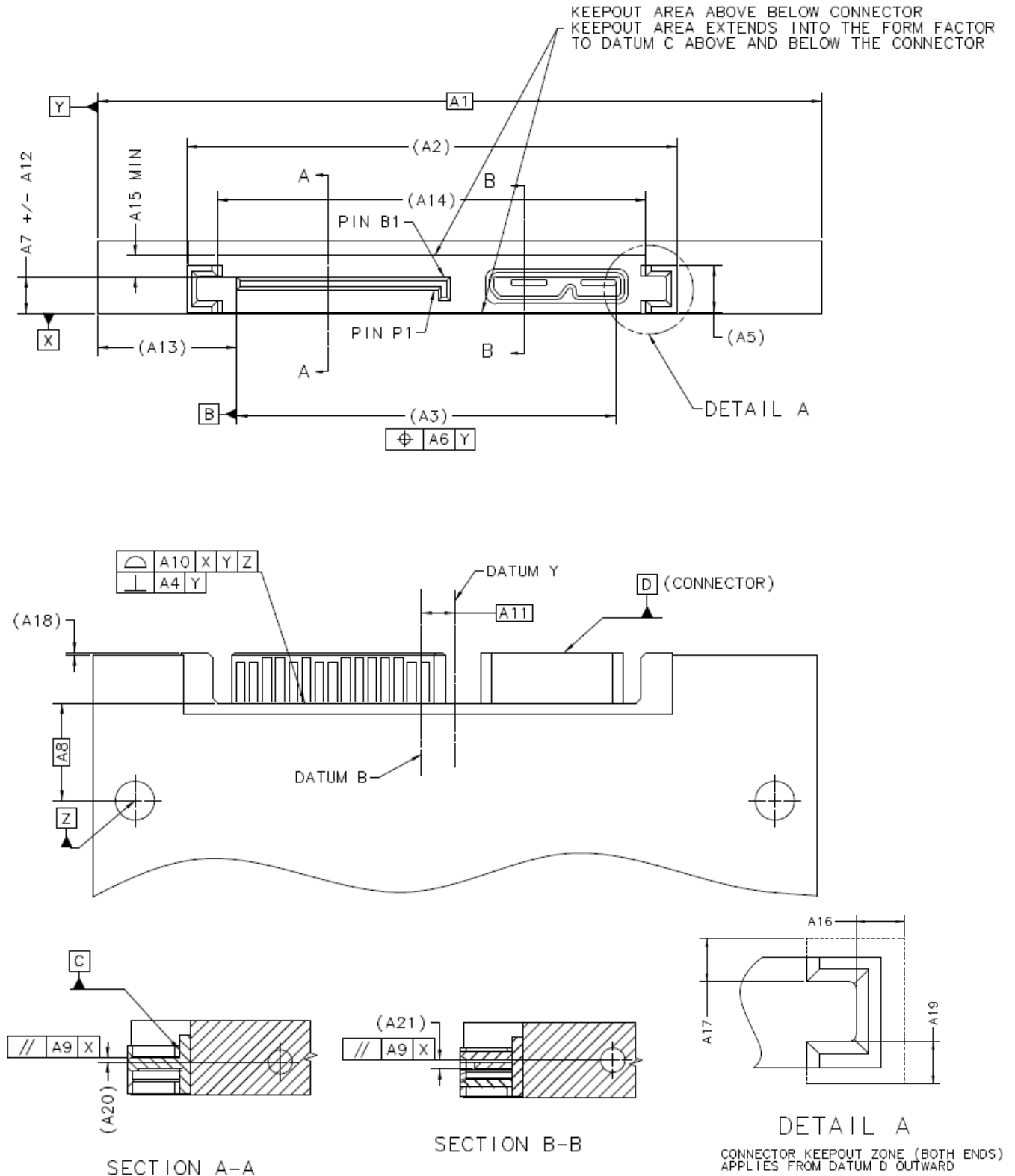
Provisions exist in the combination connector for improved mating via guides. Staggered pin lengths incorporate provision for mating ground prior to mating any other signals.

Care must be taken in the application of this drive so that excessive stress is not exerted on the connector. Backplane configurations must pay particular attention so that the connector is not damaged due to excessive side loading, compressive forces, or from supporting the weight of the device.

For a drive that can be directly inserted into the backplane of a cabinet this specification references dimensions for Option 1, the form factor bottom mounting hole or Option 2, the form factor side mounting hole. The optional approach prevents excessive tolerance stack-up between the two mounting screw locations when the connector is referenced to only one of the mounting screw locations. A drive may comply with both options but the systems application must choose either Option 1 or Option 2.

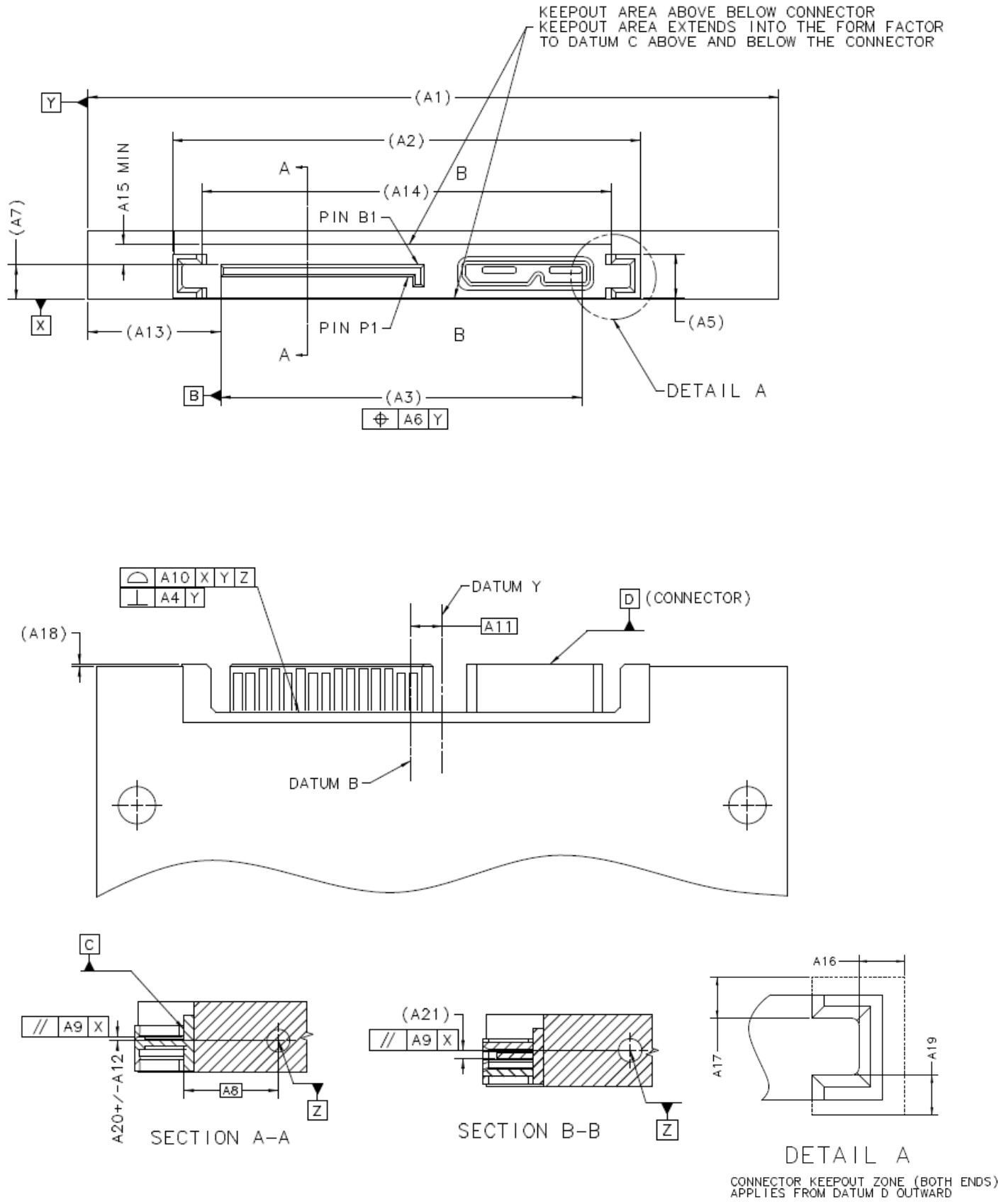
**TABLE 15-1 USB 3.0 COMBINATION CONNECTOR LOCATION**

<b>Dimension</b>	<b>Millimeters</b>	<b>Inches</b>
A 1	69.85	2.750
A 2	47.30	1.862
A 3	36.52	1.438
A 4	0.40	0.016
A 5	4.00	0.157
A 6	0.76	0.030
A 7	3.50	0.138
A 8	9.40	0.370
A 9	0.25	0.010
A10	1.00	0.039
A11	3.23	0.127
A12	0.38	0.015
A13	13.43	0.529
A14	41.34	1.628
A15	2.50	0.098
A16	1.00	0.039
A17	1.00	0.039
A18	0.30	0.012
A19	1.00	0.039
A20	0.20	0.008
A21	0.32	0.013



**FIGURE 15-1 OPTION 1: 2.5" DRIVE FORM FACTOR WITH THE COMBINATION CONNECTOR INCLUDING A USB 3.0 MICRO-B RECEPTACLE REFERENCED TO BOTTOM MOUNTING SCREWS**





**FIGURE 15-2 OPTION 2: 2.5" DRIVE FORM FACTOR WITH THE COMBINATION CONNECTOR INCLUDING A USB 3.0 MICRO-B RECEPTACLE REFERENCED TO SIDE MOUNTING SCREWS**

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

SFF Committee  
SFF-8252  
Specification for  
**2.5" Form Factor Drive with SFF-8784 Connector**

Rev 0.5 August 30 2014

Secretariat: SFF Committee

**Abstract:** This specification defines the dimensions and tolerances for location of the SFF-8784 connector on SFF-8201 compliant 2.5" form factor drives.

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.

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

POINTS OF CONTACT:

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Western Digital Corporation  
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14426 Black Walnut Court  
Saratoga CA 95070

Ph: 408-867-6630  
endlcom at acm dot org

**EXPRESSION OF SUPPORT BY MANUFACTURERS**

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

EMC  
HGST  
IBM  
LSI  
Sandisk  
TE Connectivity  
Western Digital  
Xyratex

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

Seagate

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

Amphenol  
FCI  
Finisar  
Foxconn  
Hewlett Packard  
JDS Uniphase  
Molex  
Oclaro  
Sumitomo  
Toshiba

**Update History:**

Rev 0.3 (February 26, 2013)

- Removed connector content to be incorporated into SFF-8784

Rev 0.4 (May 8, 2013)

- Removed unnecessary content related to side mounting holes in section 3.

Rev 0.5 (August 30, 2014)

- Editorial changes for consistency between specifications in revised EIA-720.

SFF Committee --

## 2.5" Form Factor Drive with SFF-8784 Connector

### 16. Scope of 8252

This specification defines the dimensions and tolerances for location of the SFF-8784 connector on SFF-8201 compliant 2.5" form factor drives.

#### 16.1 Application Specific Criteria

The environment for the 2.5" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment.

The connector does not protrude beyond the drive form factor.

### 17. References

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

#### 17.1 Industry Documents

The following standards are relevant to many SFF Specifications.

- ASME Y14.5M      Dimensioning and Tolerancing
- EIA-720          SFF 2.5" Disk Drives (nee SFF-8201)
- EIA-966          Serial Attachment 3 Gbs 2x Unshielded Connector (nee SFF-8482)
- INCITS 417-2006 Serial Attached SCSI - SAS 1.1 (nee T10/1601-D)
- INCITS 457-2010 Serial Attached SCSI - SAS 2      (nee T10/1760-D)
- INCITS 478-2011 Serial Attached SCSI - SAS 2.1 (nee T10/2125-D)
- SFF-8201          2.5" Form Factor Drive Dimensions
- SFF-8223          2.5" Form Factor Drive w/Serial Attachment Connector
- SFF-8784          0.8mm Card Edge Drive Connector
- T10/2212-D      Serial Attached SCSI - SAS 3

Additional information concerning Serial ATA may be found at [www.serialata.org](http://www.serialata.org).

#### 17.2 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>

#### 17.3 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://www.techstreet.com/incitsgate.tmp1>).

#### 17.4 Conventions

The dimensioning conventions are described in ASME-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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

## 18. General Description

This specification defines a drive that can be directly inserted into the backplane of a cabinet, without the need for a cable, and provides information necessary to assist manufacturers in the systems integration of small form factor disk drives.

Alternately, a cable may be used to supply power and to connect to the data port(s) of the drive.

This specification allows only one location for the interface connector on the drive. The scale and location of this connector enables the host system to utilize a device which is entirely within the HDA form factor.

The connector allows for the attachment of various serial interfaces.

Care must be taken in the application to avoid exerting excessive stress on the interface. Backplane configurations need to pay particular attention so that a connector is not damaged due to excessive side loading, compressive forces, or from supporting the weight of the device.

**TABLE 18-1 FORM FACTOR DIMENSIONS**

Dimension		Millimeters	Inches
A 1		69.85	2.750
A 2		1.00	0.039
A 3		9.15	0.360
A 4		0.60	0.024
A 5		0.25	0.010
A 6		2.60	0.102
A 7		10.40	0.409
A 8		28.25	1.112
A 9	Min	4.80	0.189
A10	Min	6.28	0.247
A11	Min	1.60	0.063
A12	Min	2.40	0.094
A13		3.90	0.154
A14		0.40	0.016
A15		100.3	3.949

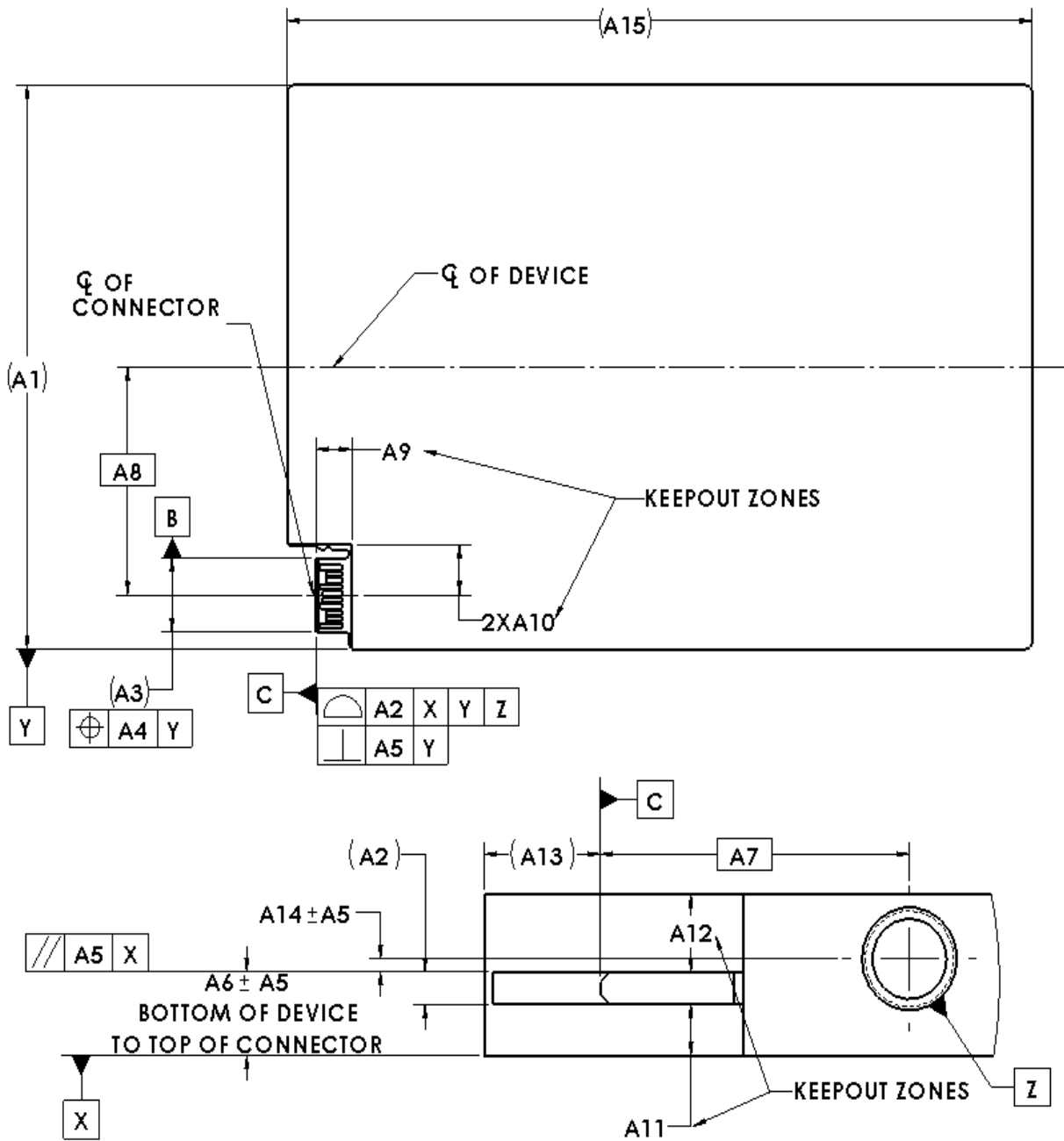


FIGURE 18-1 FORM FACTOR WITH SFF-8784 CONNECTOR LOCATION