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SFF Committee

**SFF-8523 Specification for**

**5.25" Drive Form Factor with Serial Connector**

Rev 1.4 May 4, 2005

Secretariat: SFF Committee

Abstract: This document defines the dimensions for location of the serial connector on the 5.25" Drive Form Factor for Serial Attached SCSI (SAS) applications. The location is same as that of the Serial ATA (SATA) connector location such that a system with a SAS receptacle connector may accept either a SAS or SATA drive. Additional information concerning Serial ATA may be found at <http://serialata.org>.

Revision 1.0 corrects a mistake in Revision 0.4 of the delineation of dimension A8 as well as defines a new location for the connector on the form factor by changing dimensions A7, A11, and A13. Revisions prior to 1.0 should not be used for new designs.

Revision 1.4 restores the previous location for the connector (dimensions A7, A11, and A13) as an alternate location for non-optical drives but requires the revision 1.0 location for optical drives and preferred for non-optical drives. This revision was made due to physical constraints on some non-optical devices not allowing the revision 1.0 location of the serial connector on the form factor.

The connector location is nominally flush to the drive form factor.

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

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

Support: This document 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  
Dell  
ENDL  
FCI/Berg  
Foxconn Int'l  
Fujitsu CPA  
Hitachi America  
Hitachi GST  
Honda Connector  
IBM  
Intel  
Madison Cable  
Maxtor  
Molex  
Nexans  
Seagate  
Sun Microsystems  
Tyco AMP  
Xyratex

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

Hewlett Packard

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

Amphenol  
Fujitsu Compnts  
Infineon  
Toshiba America  
Unisys  
Vitesse Semi

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

#### PRINCIPLES OF THE SFF COMMITTEE

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

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

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

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

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

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

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

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

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

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

Membership includes voting privileges on SFF Specs under development.

CD\_Access Electronic documentation contains:

- Minutes for the year-to-date plus all of last year
- Email traffic for the year-to-date plus all of last year
- The current revision of all the SFF Specifications, as well as any previous revisions distributed during the current year.

Meeting documentation contains:

- Minutes for the current meeting cycle.
- Copies of Specifications revised during the current meeting cycle.

Each electronic document mailing obsoletes the previous mailing of that year e.g. July replaces May. To build a complete set of archives of all SFF documentation, retain the last SFF CD\_Access mailing of each year.

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## Foreword

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

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

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

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

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

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

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

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

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

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SFF Committee --

## **5.25" Drive Form Factor with Serial Connector**

### **1 Scope**

The 85xx suite of specifications defines the configuration characteristics associated with 5.25" drives.

The purpose of the 85xx suite is to define the external characteristics of drives such that products from different vendors may be used in the same mounting configurations.

The set of specifications provide external dimensions, connector placement, and mounting holes to assist manufacturers in the systems integration of small form factor drives.

- SFF-8500 contains general information regarding connector space, mounting considerations and measurement requirements.
- SFF-8501 defines the dimensions of 5.25" disk drives.
- Other specifications in the 85xx family define the location of connectors on the 5.25" Drive Form Factors or additional drive form factors.

The SFF Committee was formed in August, 1990 to broaden the applications for storage devices, and is an ad hoc industry group of companies representing system integrators, peripheral suppliers, and component suppliers.

#### **1.1 Description of Clauses**

Clause 1 contains the Scope and Purpose.

Clause 2 contains Referenced and Related Standards and SFF Specifications.

Clause 3 contains the General Description.

Clause 4 contains the Definitions and Conventions.

Clause 5 contains the 5.25" Drive Form Factor with Serial connector.

### **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.

- sas-r01b SAS Proposed Serial Attached SCSI working draft
- ANSI-Y14.5M Dimension and Tolerancing
- EIA 741 Detail, SFF 5.25" Disk Drives
- SFF-8501 5 1/4" drive form factor dimensions
- SFF-8482 Serial Internal Connectors

#### **2.2 SFF Specifications**

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

- F = Forwarded     The document has been approved by the members for forwarding to a formal standards body.
- P = Published     The document has been balloted by members and is available as a published SFF Specification.
- A = Approved     The document has been approved by ballot of the members and is in preparation as an SFF Specification.
- C = Canceled      The project was canceled, and no Specification was Published.
- D = Development   The document is under development at SFF.
- E = Expired        The document has been published as an SFF Specification, and the members voted against re-publishing it when it came up for review.
- a = archive        Used as a suffix to indicate an SFF Specification which has been Archived. This specification will always be available at the ftp site and new development effort in the subject area shall be done under a new number.
- e = electronic     Used as a suffix to indicate an SFF Specification which has Expired but is still available in electronic form from SFF e.g. a specification has been incorporated into a draft or published standard which is only available in hard copy.
- i = Information    The document has no SFF project activity in progress, but it defines features in developing industry standards. The document was provided by a company, editor of an accredited standard in development, or an individual. It is provided for broad review (comments to the author are encouraged). As the copyright on such documents is retained by the author, the INF or 'i' specifications cannot be freely copied for distribution.
- s = submitted     The document is a proposal to the members for consideration to become an SFF Specification.

Spec #	Rev	List of Specifications as of May 30, 2005
-----		
SFF-8000		SFF Committee Information
INF-8001i	E	44-pin ATA (AT Attachment) Pinouts for SFF Drives
INF-8002i	E	68-pin ATA (AT Attachment) for SFF Drives
SFF-8003	E	SCSI Pinouts for SFF Drives
SFF-8004	E	Small Form Factor 2.5" Drives
SFF-8005	E	Small Form Factor 1.8" Drives
SFF-8006	E	Small Form Factor 1.3" Drives
SFF-8007	E	2mm Connector Alternatives
SFF-8008	E	68-pin Embedded Interface for SFF Drives
SFF-8009	4.1	Unitized Connector for Cabled Drives
SFF-8010	E	Small Form Factor 15mm 1.8" Drives
INF-8011i	E	ATA Timing Extensions for Local Bus
SFF-8012	3.0	4-Pin Power Connector Dimensions
SFF-8013	E	ATA Download Microcode Command
SFF-8014	C	Unitized Connector for Rack Mounted Drives
SFF-8015	E	SCA Connector for Rack Mounted SFF SCSI Drives
SFF-8016	C	Small Form Factor 10mm 2.5" Drives
SFF-8017	E	SCSI Wiring Rules for Mixed Cable Plants
SFF-8018	E	ATA Low Power Modes
SFF-8019	E	Identify Drive Data for ATA Disks up to 8 GB
INF-8020i	E	ATA Packet Interface for CD-ROMs
SFF-8025	0.7	SFF Committee Specification Categories
INF-8028i	E	- Errata to SFF-8020 Rev 2.5
SFF-8029	E	- Errata to SFF-8020 Rev 1.2
SFF-8030	2.0	SFF Committee Charter
SFF-8031		Named Representatives of SFF Committee Members



SFF-8032	1.6	SFF Committee Principles of Operation
INF-8033i	E	Improved ATA Timing Extensions to 16.6 MBs
INF-8034i	E	High Speed Local Bus ATA Line Termination Issues
INF-8035i	E	Self-Monitoring, Analysis & Reporting Technology
INF-8036i	E	ATA Signal Integrity Issues
INF-8037i	E	Intel Small PCI SIG
INF-8038i	E	Intel Bus Master IDE ATA Specification
INF-8039i	E	Phoenix EDD (Enhanced Disk Drive) Specification
SFF-8040	1.2	25-pin Asynchronous SCSI Pinout
SFF-8041	C	SCA-2 Connector Backend Configurations
SFF-8042	C	VHDCI Connector Backend Configurations
SFF-8043	E	40-pin MicroSCSI Pinout
SFF-8045	4.7	40-pin SCA-2 Connector w/Parallel Selection
SFF-8046	E	80-pin SCA-2 Connector for SCSI Disk Drives
SFF-8047	C	40-pin SCA-2 Connector w/Serial Selection
SFF-8048	C	80-pin SCA-2 Connector w/Parallel ESI
SFF-8049	E	80-conductor ATA Cable Assembly
INF-8050i	1.0	Bootable CD-ROM
INF-8051i	E	Small Form Factor 3" Drives
INF-8052i	E	ATA Interface for 3" Removable Devices
SFF-8053	5.5	GBIC (Gigabit Interface Converter)
SFF-8054	0.2	Automation Drive Interface Connector
INF-8055i	E	SMART Application Guide for ATA Interface
SFF-8056	C	50-pin 2mm Connector
SFF-8057	E	Unitized ATA 2-plus Connector
SFF-8058	E	Unitized ATA 3-in-1 Connector
SFF-8059	E	40-pin ATA Connector
SFF-8060	1.1	SFF Committee Patent Policy
SFF-8061	E	Emailing drawings over the SFF Reflector
SFF-8062		Rolling Calendar of SSWGs and Plenaries
SFF-8064		Unshielded HD Cable/Board Connector System
SFF-8065	C	40-pin SCA-2 Connector w/High Voltage
SFF-8066	C	80-pin SCA-2 Connector w/High Voltage
SFF-8067	3.4	40-pin SCA-2 Connector w/Bidirectional ESI
INF-8068i	E	Guidelines to Import Drawings into SFF Specs
SFF-8069	E	Fax-Access Instructions
INF-8070i	1.3	ATAPI for Rewritable Removable Media
SFF-8072	1.2	80-pin SCA-2 for Fibre Channel Tape Applications
SFF-8073	C	20-pin SCA-2 for GBIC Applications
INF-8074i	1.0	SFP (Small Formfactor Pluggable) Transceiver
SFF-8075	1.0	PCI Card Version of SFP Cage
SFF-8076	-	SFP Additional IDs
INF-8077i	3.1	XFP (10 Gbs Small Form Factor Pluggable Module)
SFF-8078	C	XFP-E
SFF-8079	1.7	SFP Rate and Application Selection
SFF-8080	E	ATAPI for CD-Recordable Media
SFF-8082	5.1	Labeling of Ports and Cable Assemblies
SFF-8084	0.2	0.8mm SFP Card Edge Connector Dimensioning
SFF-8085	0.9	100 Mbs Small Formfactor Transceivers
SFF-8086	1.1	Compact Multilane Series: Common Elements
SFF-8087	1.1	Compact Multilane Series: Unshielded
SFF-8088	1.0	Compact Multilane Series: Shielded
SFF-8089	1.3	SFP Rate and Application Codes
INF-8090i	6.09	ATAPI for Multimedia Devices (Mt Fuji5)
SFF-8101	C	3 Gbs and 4 Gbs Signal Characteristics
SFF-8110	C	5V Parallel 1.8" drive form factor
SFF-8111	1.3	1.8" drive form factor (60x70mm)
SFF-8122		1.8" (60x70mm) w/SCA-2 Connector

SFF-8120	2.6	1.8" drive form factor (78x54mm)
SFF-8123	C	1.8" (60x70mm) w/Serial Attachment Connector
SFF-8124	0.2	Memory Form Factor Disk Drive Connections
SFF-8131		40mmx50mm Form Factor
SFF-8200e	1.1	2 1/2" drive form factors (all of 82xx family)
SFF-8201	2.4	2 1/2" drive form factor dimensions
SFF-8212e	1.2	2 1/2" drive w/SFF-8001 44-pin ATA Connector
SFF-8221	C	Pre-Aligned 2.5" Drive >10mm Form Factor
SFF-8222	2.1	2.5" Drive w/SCA-2 Connector
SFF-8223	2.4	2.5" Drive w/Serial Attachment Connector
SFF-8225	C	2.5" Single Voltage Drive
SFF-8300	1.2	3 1/2" drive form factors (all of 83xx family)
SFF-8301	1.4	3 1/2" drive form factor dimensions
SFF-8302e	1.1	3 1/2" Cabled Connector locations
SFF-8323	1.4	3 1/2" drive w/Serial Attachment Connector
SFF-8332e	E	3 1/2" drive w/80-pin SFF-8015 SCA Connector
SFF-8337e	E	3 1/2" drive w/SCA-2 Connector
SFF-8342e	1.3	3 1/2" drive w/Serial Unitized Connector
INF-8350i	E	3 1/2" Packaged Drives
SFF-8400	C	VHDCI (Very High Density Cable Interconnect)
SFF-8401		Optical Transceiver for Short-Reach Appcns
SFF-8410	16.1	High Speed Serial Testing for Copper Links
INF-8411	1.0	High Speed Serial Testing for Backplanes
SFF-8412	12.2	HSOI (High Speed Optical Interconnect) Testing
SFF-8415	4.1	HPEI (High Performance Electrical Interconnect)
SFF-8416	14.0	HPEI Bulk Cable Measurement/Performance Reqmnts
SFF-8420	11.1	HSSDC-1 Shielded Connections
SFF-8421	2.4	HSSDC-2 Shielded Connections
SFF-8422	C	FCI Shielded Connections
SFF-8423	C	Molex Shielded Connections
SFF-8424	0.5	Dual Row HSSDC-2 Shielded Connections
SFF-8425	1.4	Single Voltage 12V Drives
SFF-8426		HSSDC Double Width
SFF-8429	0.1	Signal Specification Architecture for HSS Links
SFF-8430	4.1	MT-RJ Duplex Optical Connections
SFF-8431		SFP+
SFF-8441	14.1	VHDCI Shielded Configurations
SFF-8448	0.3	SAS Sideband Utilization
SFF-8451	10.1	SCA-2 Unshielded Connections
SFF-8452	3.1	Glitch Free Mating Connections for Multidrop Aps
SFF-8453		Shielded High Speed Serial connectors
SFF-8454		SCA-2 Enhanced HSS
SFF-8460	1.2	HSS Backplane Design Guidelines
SFF-8464	C	Improved MM HSS Optical Link Performance
SFF-8470	2.9	Multilane Copper Connector
SFF-8471	C	ZFP Multilane Copper Connector
SFF-8472	9.5	Diagnostic Monitoring Interface for Optical Xcvrs
INF-8475i	2.2	XPAK Small Formfactor Pluggable Receiver
SFF-8480	2.1	HSS (High Speed Serial) DB9 Connections
SFF-8482	1.8	Unshielded Dual Port Serial Attachment Connector
SFF-8483	C	External Serial Attachment Connector
SFF-8484	1.1	Multilane Unshielded Serial Attachment Connector
SFF-8485	0.5	Serial GPIO (General Purpose Input/Output) Bus
SFF-8500e	1.1	5 1/4" drive form factors (all of 85xx family)
SFF-8501e	1.1	5 1/4" drive form factor dimensions

SFF-8508e	1.1	5 1/4"	ATAPI CD-ROM w/audio connectors
SFF-8523	1.4	5 1/4"	drive w/Serial Attachment Connector
SFF-8551	3.2	5 1/4"	CD Drives form factor
SFF-8552	1.1	5 1/4"	9.5mm/12.7mm Optical Drive Form Factor
SFF-8572	C	5 1/4"	Tape form factor
SFF-8610	C		SDX (Storage Device Architecture)
SFF-8617			SAS Transition cables

### 2.3 Sources

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

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

Copies of SFF Specifications are available by joining the SFF Committee as an Observer or Member or by download at <ftp://ftp.seagate.com/sff>

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### 3 General Description

The application environment for the 5.25" Drive Form Factor is any computer, cabinet, or enclosure connecting to one or more drives in a restricted packaging environment. This specification defines the location of the serial interface connector on the 5.25" Drive Form Factor for Serial Attached SCSI (SAS) applications. The purpose of an SFF Specification is to provide information that will assist vendors to design products that can fit the same packaging envelope.

### 4 Definitions and Conventions

#### 4.1 Conventions

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

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

### 5 5.25" Drive Form Factor with Serial Connector

SFF-8523 defines the location of the serial interface connector on the 5.25" Drive Form Factor for Serial Attached SCSI (SAS) applications. The connector location is nominally flush to the drive form factor. Due to variations in the 5.25" form factor drawings it is not possible to control the connector location relative to a mounting holes. The connector end of the form factor is used as the connector location reference point.

This specification provides information necessary to assist manufacturers in the systems integration of small form factor drives. This specification allows only one location for the interface connector on optical drives and allows only one alternate location on non-optical drives if the location of the PCB on that device type does not allow the connector to be located in the optical drive connector location. The location is the same as that of the Serial ATA (SATA) connector location such that a SAS receptacle connector may attach to either a SAS or SATA drive. Additional information concerning Serial ATA may be found at <http://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 shall 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 5-1 defines the dimensions associated with the positioning of the serial connector on optical drives as illustrated in Figure 5-1. Optical devices shall locate the connector as illustrated in Figure 5-1. Non-optical devices should locate the connector as illustrated in Figure 5-1, but may locate the connector in the alternate location as illustrated in Figure 5-2.

**TABLE 5-1 SERIAL CONNECTOR LOCATION**

Dimension	Millimeters	Inches
A1	146.05	5.750
A2	42.73	1.682
A3	33.39	1.315
A4	0.40	0.016
A5	4.00	0.157
A6	0.76	0.030
A7	10.00	0.394
A8	4.90	0.193
A9	0.40	0.016
A10	1.00	0.039
A11	25.00	0.984
A12	0.38	0.015
A13	31.34	1.234
A14	37.20	1.465
A15	1.50	0.059
A16	1.00	0.039
A17	1.00	0.039
A18	0.50	0.020
A19	1.00	0.039

NOTES:

- 1) Reference drawings: EIA 741 Detail, SFF 5.25" Disk Drives, SFF-8501 5 1/4" drive form factor dimensions, SFF-8482 Serial Internal Connectors.
- 2) Millimeter is the controlling dimensional unit.

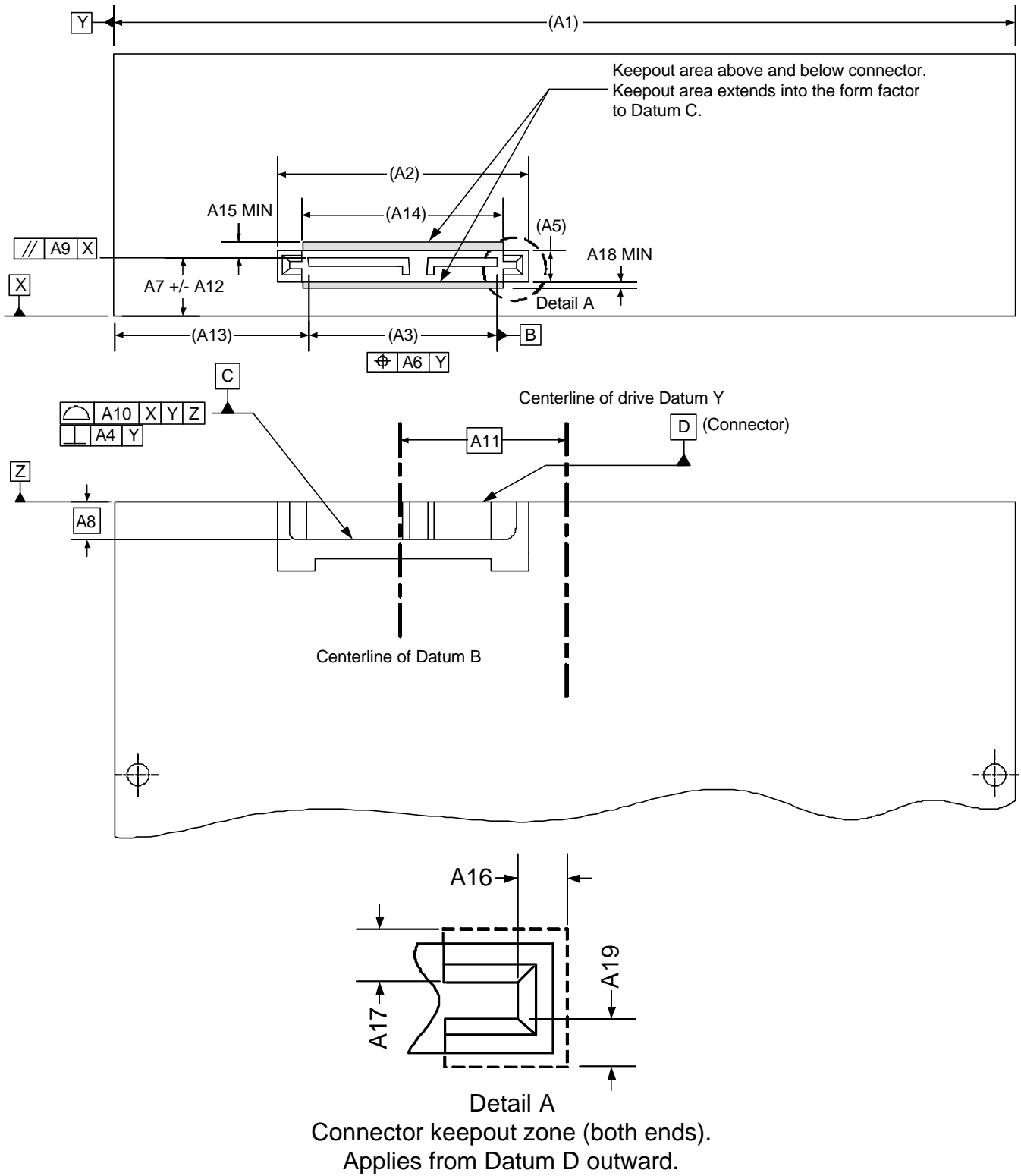


FIGURE: 5-1 5.25" OPTICAL DRIVE FORM FACTOR WITH SERIAL CONNECTOR

Table 5-2 defines the dimensions associated with the alternate positioning of the serial connector on non-optical drives as illustrated in Figure 5-2. Non-optical devices should locate the connector as illustrated in Figure 5-1, but may locate the connector in the alternate location as illustrated in Figure 5-2.

**TABLE 5-2 SERIAL CONNECTOR LOCATION**

Dimension	Millimeters	Inches
A1	146.05	5.750
A2	42.73	1.682
A3	33.39	1.315
A4	0.40	0.016
A5	4.00	0.157
A6	0.76	0.030
A7	3.50	0.138
A8	4.90	0.193
A9	0.40	0.016
A10	1.00	0.039
A11	42.90	1.689
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	0.50	0.020
A19	1.00	0.039

NOTES:

- 1) Reference drawings: EIA 741 Detail, SFF 5.25" Disk Drives, SFF-8501 5 1/4" drive form factor dimensions, SFF-8482 Serial Internal Connectors.
- 2) Millimeter is the controlling dimensional unit.

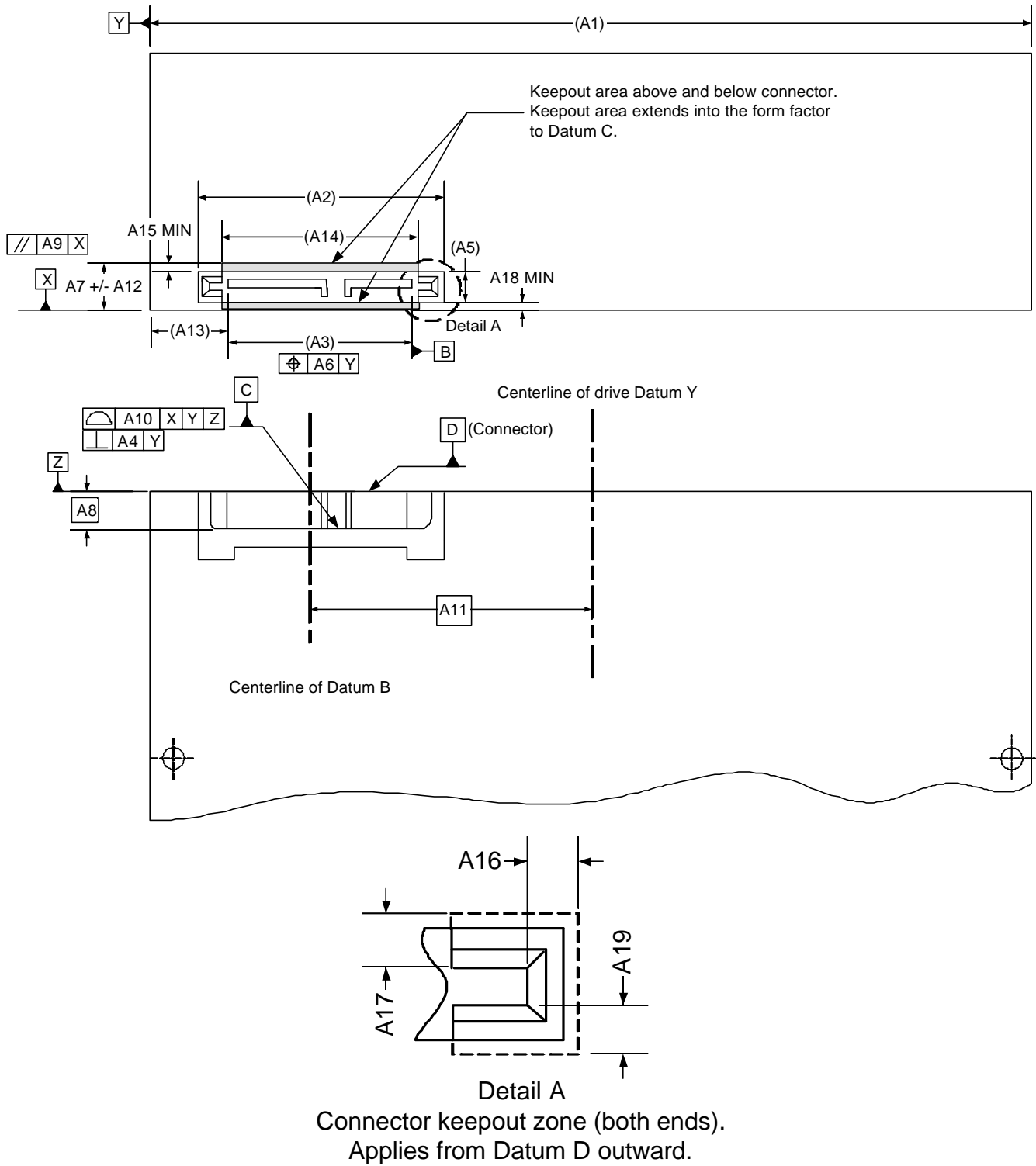


FIGURE 5-2: 5.25" NON-OPTICAL DRIVE FORM FACTOR ALTERNATE SERIAL CONNECTOR LOCATION