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

SFF Committee

SFF-8454 Specification for

SCA-2 Enhanced HSS Signals

Rev 1.5 June 12, 2007

Secretariat: SFF Committee

Abstract: This document describes performance improvements that may be achieved by internal receptacle design enhancements and modified PWB footprint designs. These changes allow the mating interface described in SFF-8451 to remain unchanged while allowing enhanced SCA-2 connectors to operate at the speeds required by 4G and 8G FibreChannel applications. Both applications continue to target the use of the SCA-2 form factor disk drive interface to enable backwards compatibility to legacy 1G and 2G Fibre Channel applications. This document preserves the SFF-8451 content while including informative enhancements that extend the high frequency electrical performance of the mated connector system.

This specification provides a common reference for systems manufacturers, system integrators, suppliers of magnetic disk drives and manufacturers of the SCA-2 connector. 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.

Amphenol
EMC
ENDL
FCI
Foxconn
Fujitsu CPA
Hewlett Packard
Hitachi GST
LSI Logic
Samsung
Seagate
Sun Microsystems
Tyco AMP
Unisys
Vitesse Semiconductor

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

Molex

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

AMCC
Brocade
Clariphy
Comax
Cornice
Cortina Systems
Emulex
Fujitsu Components
Intel
JDS Uniphase
Maxtor
Picolight
Sumitomo
Toshiba America

Foreword

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

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

The first use of these disk drives was in specific applications such as laptop portable computers and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

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

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

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

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

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

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

www.sffcommittee.com/ie/join.html

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

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

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

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

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

SFF Committee --

SCA-2 Enhanced HSS Signals

1. Scope

The SCA-2 connector system can be extended to HSS signaling rates by evaluating and if necessary modifying design details to improve the electrical performance at higher frequencies. This specification discusses and defines enhancements to the Fixed Board Vertical Receptacle that can extend this standard form factor to next generation applications.

This document specifies recommendations on the termination side of the connectors to enable functional multiple sourcing of the complete connector system. The terminology and physical requirement of the unshielded SCA-2 fixed board receptacle PCB footprint is defined. This specification includes a new in-line through-hole footprint and a new staggered through-hole footprint to support the objective of optimizing connector performance. A new SMT footprint has been added that offers both improved performance and an optional manufacturing process. The information described is for 40-pin (as used by Fibre Channel) but could also be applied to the 80-pin (as used by SCSI).

The detailed construction of the connector design between the mating and the termination sides are not controlled by this document. In the present selection of complete connectors specified there is no shielding provided, no provision for connecting shields together, and no provision for terminating shields. Therefore there are no specifications for any backshell-to-connector interfaces.

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 Physical Descriptions

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 specifications are relevant.

SFF-8451 SCA-2 Unshielded Connections

2.2 SFF Specifications

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

2.3 Sources

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

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

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

3. General Description

The direction provided by the T11.2 Electrical Ad Hoc and the desire to minimize losses in the SCA-2 transmission path while maintaining backwards compatibility is maintained in this specification. Improvements in RL and IL of the mated connector interface can be realized by enhancing the connector design for overall improved impedance matching. Further improvements in transmission performance can be realized by reducing the via diameter of the fixed receptacle connector. This is a change in the four row footprint in SFF-8451 to a two row inline footprint and a improved staggered footprint. A new SMT option to the fixed board receptacle has been added to accommodate processing options and improvements to electrical performance due to the absence of a through-hole stub and resultant discontinuity. This enhanced connector system therefore includes the following modifications and/or additions to the Fixed Receptacle connector half:

- Improved Electrical performance through optimization of the mated interface (improved matched impedance).
- Smaller via diameter size and layout pattern of the original SCA-2 footprint.
- New surface mount version.

This connector family is based on proven connector technology using the mechanically robust ribbon or leaf contact style. It is very difficult to damage the contacts.

This enhanced connector is suited to use in applications where electrical performance is optimized for signal data rates extending up to 8.5Gbps. This covers virtually all of the internal intra-enclosure applications for high speed serial applications which use copper media for transmission.

The use of this connector has no effect on the wiring rules, firmware, or system configuration rules for interfaces such as Fibre Channel, Gigabit Ethernet, Serial Attach SCSI and other high speed interconnects.

4. Definitions and Conventions

4.1 Glossary

IL: Insertion Loss
HSS: High Speed Serial
RL: Return Loss
SCA-2: Single Connector Attached -2
SMT: Surface Mount
Fixed Board: refers to connector style in SFF-8451

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

5. Description

5.1 Enhanced SCA-2 Fixed Receptacle

The SCA-2 Receptacles designed and compliant to SFF-8451 are used in Fibre Channel systems originally designed to support Gigabit data rates. Although the intra-enclosure systems designs will vary, it may be increasingly difficult to achieve specified signal requirements for next generation 4 and 8Gbit Fibre Channel systems if employing the original version SCA-2 receptacles. The objectives reflected in this document are derived to support higher Fibre Channel data rates through improved performance of the mated connector system.

Maintaining backwards compatibility as described above is realized while internal structures (contacts and/or housing/cavity) can be modified to improve the transmission of these higher data rates. Enhancements to these internal structures can improve impedance matching of the mated connector system and reduce crosstalk within the connector transmission path. Overall careful consideration to the geometries of the receptacle contacts and mating plug for better matched impedance and resultant lower reflections should provide the enhancements necessary to support next generation requirements. Further improvements to the electrical performance of this connector system can be made by footprint optimization as reflected in Appendix-A1 and discussed below.

The SMT version of the SCA-2 HSS connector (See Figure 5-2) allows system designers the option of SMT processing where this termination technique may be most desired. The internal structures of the connector have the same improvements as the HSS through-hole version.

5.15 General Tolerances

Unless otherwise stated, the following tolerances shall apply;
2 PLACE DIMENSIONS =+/- 0.20mm
Angular dimensions =+/- 3 degrees

5.2 Fixed board In-Line Press Fit

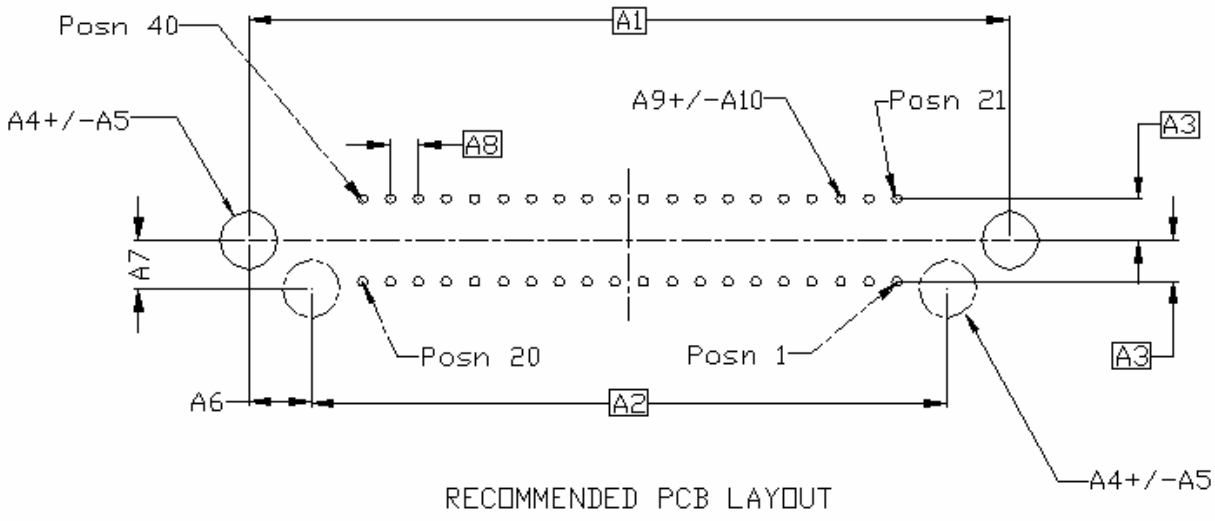


Figure 5-2 Fixed board in-line press fit

Table 5-2 Fixed board in-line press fit

Dimension	Millimeter
A1	34.37
A2	28.73
A3	1.85
A4	2.60
A5	0.10
A6	2.82
A7	2.20
A8	1.27
A9	0.45
A10	0.05

5.3 Fixed board Staggered press fit

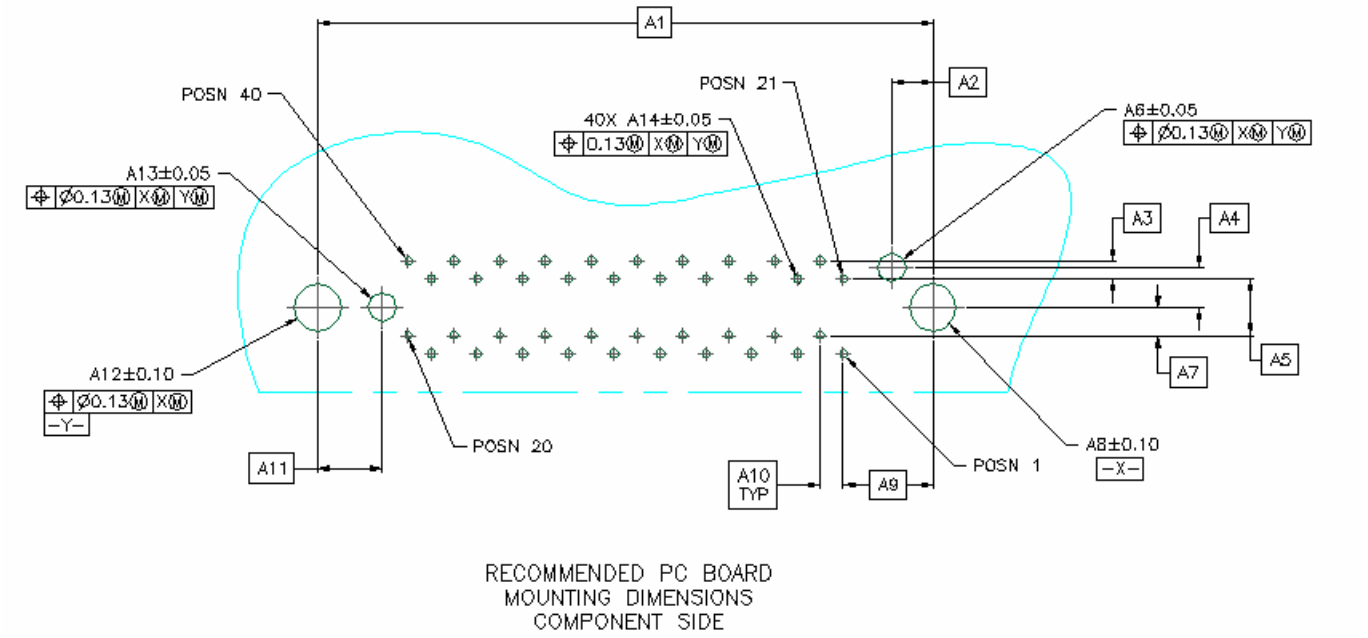
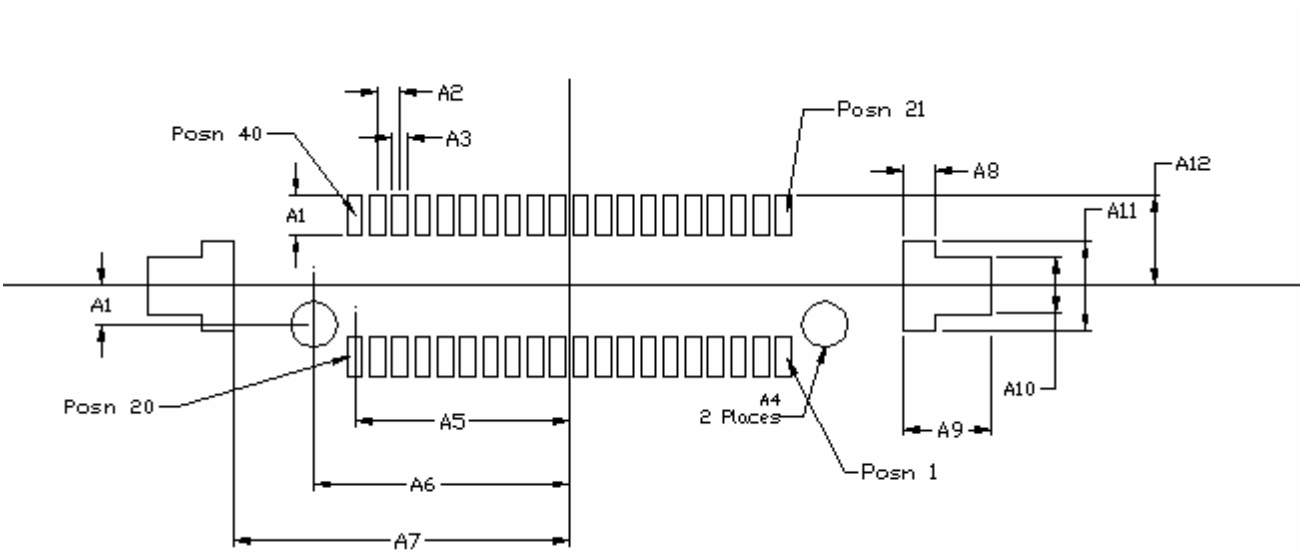


Figure 5-3 Fixed board staggered press fit

Table 5-3 Fixed board staggered press fit

Dimension	Millimeters
A1	34.11
A2	2.32
A3	1.00
A4	2.20
A5	3.13
A6	1.60
A7	1.56
A8	2.60
A9	4.99
A10	1.27
A11	3.56
A12	2.60
A13	1.60
A14	0.45

5.4 Fixed board SMT Footprint



Recommended PC board mounting dimensions

Figure 5-4 Fixed Board SMT 2 row footprint

Table 5-4 Fixed Board straight SMT 2 row

Location	Dimension mm
A1	2.20
A2	1.27
A3	0.85
A4	2.60
A5	12.06
A6	14.36
A7	18.85
A8	1.80
A9	4.90
A10	3.10
A11	5.0
A12	5.08