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

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

SFF Committee

SFF-8089 Specification for

SFP (Small Formfactor Pluggable) Rate and Application Codes

Rev 1.3   February 3, 2005

Secretariat: SFF Committee

Abstract: This specification is a companion specification to SFF-8079 SFP Rate and
Application Selection. SFF-8079 defines the hardware and software interfaces for
controlling and selecting operation among multiple application capabilities within a
single SFP module. One aspect of these interfaces is a structure for filling ROM
fields in a SFF-8079-compatible SFP module that describes the module's specific
capabilities. SFF-8089 defines specific codes for those ROM fields based on industry
standards and applications, and it is a dynamic specification that will be
periodically be updated to reflect changes in the industry. Other specifications
than SFF-8079 may also reference this specification.

This specification provides a common specification for systems manufacturers, system
integrators, and suppliers of serial communication modules. 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.

        ENDL
        Infineon
        Intel
        Nexans
        Sun Microsystems
        Vitesse Semi

The following SFF member companies voted no on the technical content of this industry specification.

        Hewlett Packard

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

        Adaptec
        Dell
        FCI/Berg
        Foxconn Int'l
        Fujitsu CPA
        Hitachi GST
        Madison Cable
        Maxtor
        Molex
        Seagate
        Tyco AMP
        Unisys

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. The patent holder has filed 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.

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.

Specifications 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 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.

    Name: _____ Title: _____

    Company: _____

    Address: _____

             _____

    Phone: _____ Fax: _____

    Email: _____

    Please register me with the SFF Committee for one year.

    ___ Voting Membership w/Electronic documentation $ 2,160

    ___ Voting Membership w/Meeting documentation $ 1,800

    ___ Non-voting Observer w/Electronic documentation $ 660 U.S.
                                                             $ 760 Overseas

    ___ Non-voting Observer w/Meeting documentation $ 300 U.S.
                                                             $ 400 Overseas

    Check Payable to SFF Committee for $_____ is Enclosed

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        SFF Committee   408-867-6630
        14426 Black Walnut Ct   408-867-2115Fx
        Saratoga CA 95070   endlcom@acm.org

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 specifications 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 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 specification 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.

Table of Contents

List of Tables

SFF Committee –

SFP (Small Formfactor Pluggable) Rate and Application Codes

1.0   Scope

This specification does not stand on its own, but is a companion specification to SFF-8079 SFP Rate and Application Selection. SFF-8089 sets the codes for the firmware tables defined within SFF-8079. Other documents than SFF-8079 may also reference this specification.

2.0   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 may be relevant to this specification.

```
 - INCITS 230-1994          FC-PH   Fibre Channel Physical Interface
 - INCITS 297-1997          FC-PH-2 Fibre Channel Physical Interface
 - INCITS 352-2002          FC-PI   Fibre Channel Physical Interface
 - INCITS 339-2000          Very Long Length Single Mode Optical Variant (SM-LL-V)
 - INCITS 364-200x          Fibre Channel -10 Gigabit (10GFC)
 - INCITS Project 1506-D    Fibre Channel Physical Interfaces - 2 (FC-PI-2)
 - INCITS Project 1625-D    Fibre Channel Physical Interfaces - 3 (FC-PI-3)
 - IEEE-802.3 Edition 2002  Ethernet Specification
 - Telcordia GR-253-CORE    Synchronous Optical Network (SONET) Transport Systems
 - ITU-T G.691              Transmission Systems/Media, Digital Systems/Networks
```

2.2   Key SFF Documents

```
 -  INF-8074       SFP (Small Formfactor Pluggable) Transceiver
 -  SFF-8472       Digital Diagnostic Monitoring Interface for Optical Transceivers
 -  SFF-8079       SFP Rate and Application Selection
```

2.3   SFF Specifications

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

```
 F = Forwarded    The specification has been approved by the members for
                  forwarding to a formal standards body.
 P = Published    The specification has been balloted by members and is
                  available as a published SFF Specification.
 A = Approved     The specification 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 specification is under development at SFF.
 E = Expired      The specification has been published, and the members
                  voted against re-publishing 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 specification has no SFF project activity in
                     progress, but it defines features in developing industry
                     standards. The specification 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 February 3, 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
```

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 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  3.3  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  4.0  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       0.8mm Card Edge Connector Mating Interface
 SFF-8087       0.8mm Unshielded Connector
 SFF-8088       0.8mm Shielded Connector
 SFF-8089  1.3  SFP Rate and Application Selection Values
 INF-8090i 1.6  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-8200e 1.1  2 1/2" drive form factors (all of 82xx family)
 SFF-8201  2.3  2 1/2" drive form factor dimensions
 SFF-8212e 1.2  2 1/2" drive w/SFF-8001 44-pin ATA Connector
 SFF-8221  3.5  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-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 10.0  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  0.0  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-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-8460  1.2  HSS Backplane Design Guidelines
SFF-8464       Improved MM HSS Optical Link Performance
SFF-8470  2.9  Multi Lane Copper Connector
SFF-8471   C   ZFP Multi Lane 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  1.5  Unshielded Dual Port Serial Attachment Connector
SFF-8483   C   External Serial Attachment Connector
SFF-8484  0.6  MultiLane Unshielded Serial Attachment Connector
SFF-8485  0.4  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  1.3  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)
```

2.4   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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        Saratoga                 408-867-2115Fx
        CA 95070
```

3.0   General Description

Based on the trend in the market to consolidate SFP transceivers in order to achieve multi-rate and multi-application capable products, an upgraded feature set for the existing Rate select, as described in INF-8074 and SFF-8472, has been developed and specified in SFF-8079.

In order to support a wide variety of applications, two-pin hardware and two-byte serial software interfaces have been defined in SFF-8079. SFF-8079 also defines how the specific applications that a single SFP transceiver supports are listed in the module's ROM, and how the list is read and how a specific application is selected by the host.

SFF-8079 defines the ROM memory space to be within A0h byte 128 to 255. Two bytes for each supported application represent a category and a sub-category. This helps organization and provides sufficient room for up to 63 variants to allow a wide range of potential solutions. Further details can be found in SFF-8079.

SFF-8089 attempts to provide a complete "shopping list" of possible applications based on industry standards. Module vendors can select a sub-list of applications they want to support and program the associated codes into the A0h memory space. In addition to industry standard applications, space is set aside for proprietary or custom applications (details would be provided within the module vendor's data sheets).

This specification is expected to be updated frequently to track and reflect the dynamic market and new or upcoming solutions.

4.0 SFP Rate and Application Codes

4.1 Introduction

Within this clause, the application codes are listed for use according to SFF-8079.

Table 4-1 is the complete "shopping list" of information needed to create the vendor-specific list of supported applications in module memory. The table shows the associated hex codes (Byte 1 and Byte 2) assigned for each application (see SFF-8079 for an explanation for usage of Byte 1 and Byte 2). The Description columns are informative and further describe the listed applications.

The table incorporates room for each category and sub-category in order to allow implementation of future options.

4.2   Application Code Table (ACT)

Table 4-1   Application Code Table

Byte 1# (hex)	Byte 2# (hex)	Category	Variant		Description	
		Standard	Bit Rate [Mb/s]	Variant	According to	Comment
0	00-FF	custom		custom	Reserved for vendor specific use	
1	00	Fibre Channel	1.062,50	100-Mx-SN-I	FC-PI-2	
1	01	Fibre Channel	1.062,50	100-SM-LC-L	FC-PI-2	
1	02	Fibre Channel	1.062,50	100-SM-LL-V	FC-PI-2	
1	03	Fibre Channel	1.062,50	100-SE-EL-S	FC-PI-2	
1	04	Fibre Channel	1.062,50	100-DF-EL-S	FC-PI-2	
1	05-09	Fibre Channel	1.062,50	*RFU*		Reserved for future Use
1	0A	Fibre Channel	2.125,00	200-Mx-SN-I	FC-PI-2	
1	0B	Fibre Channel	2.125,00	200-SM-LC-L	FC-PI-2	
1	0C	Fibre Channel	2.125,00	200-SM-LL-V	FC-PI-2	
1	0D	Fibre Channel	2.125,00	200-SE-EL-S	FC-PI-2	
1	0E	Fibre Channel	2.125,00	200-DF-EL-S	FC-PI-2	
1	0F-13	Fibre Channel	2.125,00	*RFU*		Reserved for future Use
1	14	Fibre Channel	4.250,00	400-Mx-SN-S	FC-PI-2	
1	15	Fibre Channel	4.250,00	400-SM-LC-L	FC-PI-2	
1	16	Fibre Channel	4.250,00	400-DF-EL-S	FC-PI-2	
1	17	Fibre Channel	4.250,00	400-SE-EL-S	FC-PI-2	
1	18	Fibre Channel	4.250,00	MMF 62.5	FC-PI-4	
1	19	Fibre Channel	4.250,00	MMF 50	FC-PI-4	
1	1A-31	Fibre Channel	4.250,00	*RFU*		Reserved for future Use
1	32	Fibre Channel	8.500,00	800-Mx-SN-I		
1	33	Fibre Channel	8.500,00	800-SM-LL-L		
1	34-59	Fibre Channel	8.500,00	*RFU*		Reserved for future Use
1	5A	Fibre Channel	10.518,75	1200-Mx-SN-I	10GFC	
1	5B	Fibre Channel	10.518,75	1200-SM-LL-L	10GFC	
1	5C	Fibre Channel	10.519,75	1200-SM-LC-L	FC-PI-3	
1	5D-FF	Fibre Channel	*RFU*			Reserved for future Use
2	00	Ethernet	125,00	100BASE-FX	802.3-2002	
2	01	Ethernet	125,00	100BASE-LX/LX10	802.3ah	
2	02	Ethernet	125,00	100BASE-BX10	802.3ah	
2	03-04	Ethernet	125,00	*RFU*		Reserved for future Use
2	05	Ethernet	1.250,00	1000BASE-SX	IEEE P802.3z	
2	06	Ethernet	1.250,00	1000BASE-LX	IEEE P802.3z	
2	07	Ethernet	1.250,00	1000BASE-BX10	802.3ah	
2	08	Ethernet	1.250,00	1000BASE-LX10	802.3ah	
2	09	Ethernet	1.250,00	1000BASE-PX10	802.3ah	
2	0A	Ethernet	1.250,00	1000BASE-LX20	802.3ah	
2	0B	Ethernet	1.250,00	1000BASE-CX	IEEE P802.3z	
2	0C	Ethernet	1.250,00	1000BASE T	IEEE P802.3z	
2	0D-13	Ethernet	1.250,00	*RFU*		Reserved for future Use
2	14	Ethernet	9.953,28	10GBASE-SW	IEEE P802.3ae	
2	15	Ethernet	9.953,28	10GBASE-LW	IEEE P802.3ae	
2	16	Ethernet	10.312,50	10GBASE-LR	IEEE P802.3ae	
2	17	Ethernet	9.953,28	10GBASE-EW	IEEE P802.3ae	
2	18	Ethernet	10.312,50	10GBASE-ER	IEEE P802.3ae	
2	19	Ethernet	10.312,50	10GBASE-T	IEEE 802.3 xx	
2	1A-FF	Ethernet	*RFU*			Reserved for future Use

Byte 1# (hex)	Byte 2# (hex)	Category	Variant			Description	
		Standard	Bit Rate [Mb/s]	Variant		According to	Comment
3	00	SONET/SDH	155,52	I-1		ITU-T G.957	
3	01	SONET/SDH	155,52	S-1.1		ITU-T G.957	
3	02	SONET/SDH	155,52	S-1.2		ITU-T G.957	
3	03	SONET/SDH	155,52	L-1.1		ITU-T G.957	
3	04	SONET/SDH	155,52	L-1.2		ITU-T G.957	
3	05	SONET/SDH	155,52	L-1.3		ITU-T G.957	
3	06	SONET/SDH	155,52	SR-1		Telcordia GR-253-CORE	
3	07	SONET/SDH	155,52	IR-1		Telcordia GR-253-CORE	
3	08	SONET/SDH	155,52	IR-2		Telcordia GR-253-CORE	
3	09	SONET/SDH	155,52	LR-1		Telcordia GR-253-CORE	
3	0A	SONET/SDH	155,52	LR-2		Telcordia GR-253-CORE	
3	0B	SONET/SDH	155,52	LR-3		Telcordia GR-253-CORE	
3	0C-1D	SONET/SDH	155,52	*RFU*			Reserved for future Use
3	1E	SONET/SDH	622,08	I-4		ITU-T G.957	
3	1F	SONET/SDH	622,08	S-4.1		ITU-T G.957	
3	20	SONET/SDH	622,08	S-4.2		ITU-T G.957	
3	21	SONET/SDH	622,08	L-4.1		ITU-T G.957	
3	22	SONET/SDH	622,08	L-4.2		ITU-T G.957	
3	23	SONET/SDH	622,08	L-4.3		ITU-T G.957	
3	24	SONET/SDH	622,08	V-4.1		ITU-T G.691	
3	25	SONET/SDH	622,08	V-4.2		ITU-T G.691	
3	26	SONET/SDH	622,08	V-4.3		ITU-T G.691	
3	27	SONET/SDH	622,08	U-4.2		ITU-T G.691	
3	28	SONET/SDH	622,08	U-4.3		ITU-T G.691	
3	29	SONET/SDH	622,08	SR-1		Telcordia GR-253-CORE	
3	2A	SONET/SDH	622,08	IR-1		Telcordia GR-253-CORE	
3	2B	SONET/SDH	622,08	IR-2		Telcordia GR-253-CORE	
3	2C	SONET/SDH	622,08	LR-1		Telcordia GR-253-CORE	
3	2D	SONET/SDH	622,08	LR-2		Telcordia GR-253-CORE	
3	2E	SONET/SDH	622,08	LR-3		Telcordia GR-253-CORE	
3	2F-3B	SONET/SDH	622,08	*RFU*			Reserved for future Use
3	3C	SONET/SDH	2.488,32	I-16		ITU-T G.957	
3	3D	SONET/SDH	2.488,32	S-16.1		ITU-T G.957	
3	3E	SONET/SDH	2.488,32	S-16.2		ITU-T G.957	
3	3F	SONET/SDH	2.488,32	L-16.1		ITU-T G.957	
3	40	SONET/SDH	2.488,32	L-16.2		ITU-T G.957	
3	41	SONET/SDH	2.488,32	L-16.3		ITU-T G.957	
3	42	SONET/SDH	2.488,32	V-16.2		ITU-T G.691	
3	43	SONET/SDH	2.488,32	V-16.3		ITU-T G.691	
3	44	SONET/SDH	2.488,32	U-16.2		ITU-T G.691	
3	45	SONET/SDH	2.488,32	U-16.3		ITU-T G.691	
3	46	SONET/SDH	2.488,32	SR-1		Telcordia GR-253-CORE	
3	47	SONET/SDH	2.488,32	IR-1		Telcordia GR-253-CORE	
3	48	SONET/SDH	2.488,32	IR-2		Telcordia GR-253-CORE	
3	49	SONET/SDH	2.488,32	LR-1		Telcordia GR-253-CORE	
3	4A	SONET/SDH	2.488,32	LR-2		Telcordia GR-253-CORE	
3	4B	SONET/SDH	2.488,32	LR-3		Telcordia GR-253-CORE	
3	4C-59	SONET/SDH	2.488,32	*RFU*			Reserved for future Use
3	5A	SONET/SDH	9.953,28	VSR600-2M1		ITU-T G.vsr	
3	5B	SONET/SDH	9.953,28	VSR600-2M2		ITU-T G.vsr	
3	5C	SONET/SDH	9.953,28	VSR600-2M5		ITU-T G.vsr	

Byte 1# (hex)	Byte 2# (hex)	Category	Variant		Description	
		Standard	Bit Rate [Mb/s]	Variant	According to	Comment
3	5D	SONET/SDH	9.953,28	I-64.1r	ITU-T G.691	
3	5E	SONET/SDH	9.953,28	I-64.1	ITU-T G.691	
3	5F	SONET/SDH	9.953,28	I-64.2r	ITU-T G.691	
3	60	SONET/SDH	9.953,28	I-64.2	ITU-T G.691	
3	61	SONET/SDH	9.953,28	I-64.3	ITU-T G.691	
3	62	SONET/SDH	9.953,28	I-64.5	ITU-T G.691	
3	63	SONET/SDH	9.953,28	S-64.1	ITU-T G.691	
3	64	SONET/SDH	9.953,28	S-64.2a	ITU-T G.691	
3	65	SONET/SDH	9.953,28	S-64.2b	ITU-T G.691	
3	66	SONET/SDH	9.953,28	S-64.3a	ITU-T G.691	
3	67	SONET/SDH	9.953,28	S-64.3b	ITU-T G.691	
3	68	SONET/SDH	9.953,28	S-64.5a	ITU-T G.691	
3	69	SONET/SDH	9.953,28	S-64.5b	ITU-T G.691	
3	6A	SONET/SDH	9.953,28	L-64.1	ITU-T G.691	
3	6B	SONET/SDH	9.953,28	L-64.2a	ITU-T G.691	
3	6C	SONET/SDH	9.953,28	L-64.2b	ITU-T G.691	
3	6D	SONET/SDH	9.953,28	L-64.2c	ITU-T G.691	
3	6E	SONET/SDH	9.953,28	L-64.3	ITU-T G.691	
3	6F	SONET/SDH	9.953,28	V-64.2a	ITU-T G.691	
3	70	SONET/SDH	9.953,28	V-64.2b	ITU-T G.691	
3	71	SONET/SDH	9.953,28	V-64.3	ITU-T G.691	
3	72	SONET/SDH	9.953,28	SR-1	Telcordia GR-253-CORE	
3	73	SONET/SDH	9.953,28	SR-2	Telcordia GR-253-CORE	
3	74	SONET/SDH	9.953,28	IR-1	Telcordia GR-253-CORE	
3	75	SONET/SDH	9.953,28	IR-2	Telcordia GR-253-CORE	
3	76	SONET/SDH	9.953,28	IR-3	Telcordia GR-253-CORE	
3	77	SONET/SDH	9.953,28	LR-1	Telcordia GR-253-CORE	
3	78	SONET/SDH	9.953,28	LR-2a	Telcordia GR-253-CORE	
3	79	SONET/SDH	9.953,28	LR-2b	Telcordia GR-253-CORE	
3	7A	SONET/SDH	9.953,28	LR-2c	Telcordia GR-253-CORE	
3	7B	SONET/SDH	9.953,28	LR-3	Telcordia GR-253-CORE	
3	7C	SONET/SDH	9.953,28	VR-1	Telcordia GR-253-CORE	
3	7D	SONET/SDH	9.953,28	VR-2a	Telcordia GR-253-CORE	
3	7E	SONET/SDH	9.953,28	VR-3	Telcordia GR-253-CORE	
3	7F-FF	SONET/SDH	*RFU*			Reserved for future Use
4	00	Infiniband	2.500,00	IB-1x-SX	IBA_Vol2_Rel1.1_ physical_spec	
4	01	Infiniband	2.500,00	IB-1x-LX	IBA_Vol2_Rel1.1_ physical_spec	
4	02	Infiniband	2.500,00	1x copper active	IBA_Vol2_Rel1.1_ physical_spec	
4	03	Infiniband	2.500,00	1x copper passive	IBA_Vol2_Rel1.1_ physical_spec	
4	04-FF	Infiniband	*RFU*			Reserved for future Use
5	00	SBCON	200,00	ESCON, MMF 1310nm LED	SBCON_X3.296_199x_ Rev.2.3	
5	01	SBCON	200,00	ESCON, SMF 1310nm Laser	SBCON_X3.296_199x_ Rev.2.3	
5	02-FF	SBCON	*RFU*			Reserved for future Use
6	00	Copper channel loss	1.062,50	100-Delta-Cu-0.5dB	Loss Measured at ½ the Baudrate	0.5 dB Loss for copper channel
6	01	Copper channel loss	1.062,50	100-Delta-Cu-1dB	Loss Measured at ½ the Baudrate	1dB Loss for copper channel

Byte 1# (hex)	Byte 2# (hex)	Category	Variant		Description	
		Standard	Bit Rate [Mb/s]	Variant	According to	Comment
6	02	Copper channel loss	1.062,50	100-Delta-Cu-1.5dB	Loss Measured at ½ the Baudrate	1.5dB Loss for copper channel
6	03	Copper channel loss	1.062,50	100-Delta-Cu-2dB	Loss Measured at ½ the Baudrate	2dB Loss for copper channel
6	04	Copper channel loss	1.062,50	100-Delta-Cu-2.5dB	Loss Measured at ½ the Baudrate	2.5dB Loss for copper channel
6	05	Copper channel loss	1.062,50	100-Delta-Cu-3dB	Loss Measured at ½ the Baudrate	3dB Loss for copper channel
6	06	Copper channel loss	1.062,50	100-Delta-Cu-3.5dB	Loss Measured at ½ the Baudrate	3.5dB Loss for copper channel
6	07	Copper channel loss	1.062,50	100-Delta-Cu-4dB	Loss Measured at ½ the Baudrate	4dB Loss for copper channel
6	08	Copper channel loss	1.062,50	100-Delta-Cu-4.5dB	Loss Measured at ½ the Baudrate	4.5dB Loss for copper channel
6	09	Copper channel loss	1.062,50	100-Delta-Cu-5dB	Loss Measured at ½ the Baudrate	5dB Loss for copper channel
6	0A	Copper channel loss	1.062,50	100-Delta-Cu-5.5dB	Loss Measured at ½ the Baudrate	5.5dB Loss for copper channel
6	0B	Copper channel loss	1.062,50	100-Delta-Cu-6dB	Loss Measured at ½ the Baudrate	6dB Loss for copper channel
6	0C	Copper channel loss	1.062,50	100-Delta-Cu-6.5dB	Loss Measured at ½ the Baudrate	6.5dB Loss for copper channel
6	0D	Copper channel loss	1.062,50	100-Delta-Cu-7dB	Loss Measured at ½ the Baudrate	7dB Loss for copper channel
6	0E	Copper channel loss	1.062,50	100-Delta-Cu-7.5dB	Loss Measured at ½ the Baudrate	7.5dB Loss for copper channel
6	0F-13	Copper channel loss	1.062,50	*RFU*		Reserved for future Use
6	14	Copper channel loss	2.125,00	200-Delta-Cu	Loss Measured at ½ the Baudrate	
6	15	Copper channel loss	2.125,00	200-Delta-Cu-0.75dB	Loss Measured at ½ the Baudrate	0.75dB Loss for copper channel
6	16	Copper channel loss	2.125,00	200-Delta-Cu-1.5dB	Loss Measured at ½ the Baudrate	1.5dB Loss for copper channl
6	17	Copper channel loss	2.125,00	200-Delta-Cu-2.25dB	Loss Measured at ½ the Baudrate	2.25dB Loss for copper channel
6	18	Copper channel loss	2.125,00	200-Delta-Cu-3dB	Loss Measured at ½ the Baudrate	3dB Loss for copper channel
6	19	Copper channel loss	2.125,00	200-Delta-Cu-3.75dB	Loss Measured at ½ the Baudrate	3.75dB Loss for copper channel
6	1A	Copper channel loss	2.125,00	200-Delta-Cu-4.5dB	Loss Measured at ½ the Baudrate	4.5dB Loss for copper channel
6	1B	Copper channel loss	2.125,00	200-Delta-Cu-5.25dB	Loss Measured at ½ the Baudrate	5.25dB Loss for copper channel
6	1C	Copper channel loss	2.125,00	200-Delta-Cu-6dB	Loss Measured at ½ the Baudrate	6dB Loss for copper channel
6	1D	Copper channel loss	2.125,00	200-Delta-Cu-6.75dB	Loss Measured at ½ the Baudrate	6.75dB Loss for copper channel
6	1E	Copper channel loss	2.125,00	200-Delta-Cu-7.5dB	Loss Measured at ½ the Baudrate	7.5dB Loss for copper channel
6	1F	Copper channel loss	2.125,00	200-Delta-Cu-8.25dB	Loss Measured at ½ the Baudrate	8.25dB Loss for copper channel
6	20	Copper channel loss	2.125,00	200-Delta-Cu-9dB	Loss Measured at ½ the Baudrate	9dB Loss for copper channel
6	21	Copper channel loss	2.125,00	200-Delta-Cu-9.75dB	Loss Measured at ½ the Baudrate	9.75dB Loss for copper channel
6	22	Copper channel loss	2.125,00	200-Delta-Cu-10.5dB	Loss Measured at ½ the Baudrate	10.5dB Loss for copper channel

Byte 1# (hex)	Byte 2# (hex)	Category	Variant		Description	
		Standard	Bit Rate [Mb/s]	Variant	According to	Comment
6	23	Copper channel loss	2.125,00	200-Delta-Cu-11.25dB	Loss Measured at ½ the Baudrate	11.25dB Loss for copper channel
6	24-28	Copper channel loss	2.125,00	*RFU*		Reserved for future Use
6	29	Copper channel loss	4.250,00	400-Delta-Cu-1dB	Loss Measured at ½ the Baudrate	1dB Loss for copper channel
6	2A	Copper channel loss	4.250,00	400-Delta-Cu-2dB	Loss Measured at ½ the Baudrate	2dB Loss for copper channel
6	2B	Copper channel loss	4.250,00	400-Delta-Cu-3dB	Loss Measured at ½ the Baudrate	3dB Loss for copper channel
6	2C	Copper channel loss	4.250,00	400-Delta-Cu-4dB	Loss Measured at ½ the Baudrate	4dB Loss for copper channel
6	2D	Copper channel loss	4.250,00	400-Delta-Cu-5dB	Loss Measured at ½ the Baudrate	5dB Loss for copper channel
6	2E	Copper channel loss	4.250,00	400-Delta-Cu-6dB	Loss Measured at ½ the Baudrate	6dB Loss for copper channel
6	2F	Copper channel loss	4.250,00	400-Delta-Cu-7dB	Loss Measured at ½ the Baudrate	7dB Loss for copper channel
6	30	Copper channel loss	4.250,00	400-Delta-Cu-8dB	Loss Measured at ½ the Baudrate	8dB Loss for copper channel
6	31	Copper channel loss	4.250,00	400-Delta-Cu-9dB	Loss Measured at ½ the Baudrate	9dB Loss for copper channel
6	32	Copper channel loss	4.250,00	400-Delta-Cu-10dB	Loss Measured at ½ the Baudrate	10dB Loss for copper channel
6	33	Copper channel loss	4.250,00	400-Delta-Cu-11dB	Loss Measured at ½ the Baudrate	11dB Loss for copper channel
6	34	Copper channel loss	4.250,00	400-Delta-Cu-12dB	Loss Measured at ½ the Baudrate	12dB Loss for copper channel
6	35	Copper channel loss	4.250,00	400-Delta-Cu-13dB	Loss Measured at ½ the Baudrate	13dB Loss for copper channel
6	36	Copper channel loss	4.250,00	400-Delta-Cu-14dB	Loss Measured at ½ the Baudrate	14dB Loss for copper channel
6	37	Copper channel loss	4.250,00	400-Delta-Cu-15dB	Loss Measured at ½ the Baudrate	15dB Loss for copper channel
6	38-FF	Copper channel loss	*RFU*			Reserved for future Use
7-20	00-FF	RFU				Reserved for future Use

4.3 Copper SFP implementation overview

This section defines non-standardized extensions to SFF-8079 to enable application-dependent customization of a host's SerDes or Retimer outputs to drive a passive SFP with an attached copper cable. The host system will read the SFP registers and set an optimum pre-emphasis level, based on pre-determined loss properties of the cable, to drive the assembly without the need of additional equalization. The default setting for host pre-emphasis level is "off", appropriate to drive an optical module.

Table 4-1 Byte 1# value 6h stores a code that specifies the copper SFP assembly's loss data at ½ the baudrate of its highest designed baudrate of operation. A cable assembly designed for 4.25 Gbd shall also store loss data for 1.0625 Gbd and 2.125 Gbd, as this will improve the resolution for pre-emphasis and support operation at multiple data rates. A new cable assembly designed for 2.125 Gbd shall also store loss data for 1.0625 Gbd. A cable assembly designed for lower baudrates does not need to store loss data for higher baudrates. A cable assembly designed for 2.125 Gbd or 4.25 Gbd shall have a maximum frequency response deviation at the specified frequencies of +/-0.5 dB.