SFF-8024

Specification for

SFF Module Management Reference Code Tables

Rev 4.10   November 24, 2022

SECRETARIAT: SFF TA TWG

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ABSTRACT: This specification provides codes for module identifiers, encoding values, connector types, extended compliance codes, host electrical interfaces and module media interfaces.

This specification is the reference source for identifiers assigned to interpret the memory maps of self-identifying modules.

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Foreword

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

For those who wish to participate in the activities of the SFF TWG, the signup for membership can be found at http://www.snia.org/sff/join.

Revision History

Rev 0.7	-	Table 3-1 changed per comments received during ballot
	-	Figure 3-3 example added
Rev 0.8	-	As requested by Transceiver SSWG, added color to Figure 3-3
Rev 0.9	-	As requested, filled in more cells for SFP+ and CXP.
Rev 1.0	-	Corrected CXP 802.3ba as applicable to SFF-8647
Rev 1.1	-	Removed logo on connectors in Figure 3-1 and Figure 3-2
Rev 1.2	-	Changed '>' to 'and' in Table 3-1
	-	Added table for Identifier Values as per Transceiver SSWG
	-	Added table for Encoding Values
Rev 1.3	-	Added SFP+ 4 Gb/s to Table 3-1
Rev 1.4	-	Expanded the Identifier Values table
	-	Added table for Specification Compliance Codes
	-	Added table for Extended Specification Compliance Codes
Rev 1.5	-	Expanded single sentence about SFF-8063 to a paragraph with emphasis
Rev 1.6	-	Identified superseded specifications in Table 3-1
Rev 1.7	-	Expanded HD to include unshielded and add 24 Gb/s
Rev 1.8	-	Aligned SFP naming w/QSFP nomenclature
Rev 1.9	-	Added 0Bh to the Extended Specification Compliance Codes
Rev 2.0	-	Changed SFP Common Management Spec to SFF-8472
	-	Deleted 802.3bj from 28 Gb/s CXP
Rev 2.1	-	Aligned CXP and HD naming w/QSFP nomenclature
Rev 2.2	-	Replaced duplicated codes 08-0Ah in the Extended Specification Compliance Codes
	-	Clarified active cable and CWDM4 codes
Rev 2.3	-	Expanded 0Bh in Identifier Values to include SFP+
	-	Added 13-16h to the Extended Specification Compliance Codes
	-	The Encoding Values which were thought to be common between SFF-8472 and SFF-8636 are not. The table was deleted and restored to SFF-8636.
	-	The Specification Compliance Codes are not subject to change. The table was deleted and restored to SFF-8636.
Rev 2.4	-	Added 13h to Identifier Values
Rev 2.5	-	Restored the Encoding Values from SFF-8472 and SFF-8636
	-	Added Connector Types from SFF-8472 and SFF-8636
	-	Added 07h to Encoding Values
	-	Added 0Dh and 24h to Connector Types
	-	Split Table 3-1 Integrated Pluggable Solution specifications which were referenced by another Integrated Pluggable Solution: o SFF-8084 reference changed to SFF-8071
		o SFF-8431 reference changed to SFF-8419
		o SFF-8643 reference changed to SFF-8613
		o SFF-8644 reference changed to SFF-8614
		o SFF-8647 reference changed to SFF-8617
Rev 2.6	-	Added note in 4.1 about overlap with CFP MSA codes
	-	Removed IEEE references from CXP rows
Rev 2.7	-	Added 14-15h Fanouts to Identifier Values
Rev 2.8	-	Added specification numbers for QSFPx management
	-	Added SFF-8418 to Table 3-1

Rev 2.9	-	Added 16h 10GBASE-T with SFI electrical interface to Extended Specification Compliance Codes
Rev 3.0	-	Added 17h QSFP28 100G CLR4 to Extended Specification Compliance Codes
Rev 3.1	-	Renamed Table 3-1 and added Table 3-2 Device Connectors
Rev 3.2	-	Renamed Mini-SAS HD as Mini Multilane HD in Figure 3-2
	-	Updated Identifier Values with backward compatible cables and modules
	-	Added 25G Ethernet and AOC, ACC equivalents to Extended Specification Compliance Codes
Rev 3.3	-	Added Extended SCC 17h microQSFP
Rev 3.4	-	Added Extended SCC 1Ah 2 lambda DWDM 100G
	-	Added Encoding Value 08h PAM4
Rev 3.5	-	Replaced Table 3-2
Rev 3.6	-	Removed reference to SFF-8436 for Extended Compliance Codes in 4
Rev 3.7	-	Corrected entries for CWDM4
Rev 3.8	-	Added 25GBASE to 03h and 04h 100GBASE
Rev 3.9	-	*14-Mar-16*
	-	Changed 1Ah acronym to 100GE-DWDM2 and added description
Rev 4.0	-	*27-Jun-16*
	-	Added new codes 1Bh-20h in Extended compliance codes Table 4-4
Rev 4.2	-	Added new code 21h (100G PAM4 BiDi) in Extended compliance code Table 4-4
Rev 4.3	-	Added new code 19h for OSFP in Identifier values Table 4-1
	-	Added new code 22h for 4WDM-10 MSA in Table 4-4
	-	Added new code 23h for 4WDM-20 MSA in Table 4-4
	-	Added new code 24h for 4WDM-40 MSA in Table 4-4
Rev 4.4	-	*11-Jun-17*
	-	Incorporated changes from June 7 2017 meeting including:
	-	Deleted all references to Seagate FTP site
	-	Restructured Table 3-1
	-	Updated Fig 3-3
	-	Added multi-lane text to section 4.4
	-	Changed ANSI reference to INCITS
Rev 4.5	-	*29-Jun-18*
	-	Updated Tables 3-1, 3-2
	-	Added new code 1Ah for SFP-DD in Table 4-1
	-	Added new codes for CS and mini CS connectors to Table 4-3
	-	Added new codes for 50G/lane and 100G PMDs in Table 4-4
	-	Added new codes for 64GFC and 128GFC in Table 4-4
	-	Added Module-Host Electrical Interface Codes as Table 4-5
Rev 4.6	-	*8-Mar-19*
	-	Changed name from 'SFF Cross Reference to Industry Products' to 'SFF Module Management Reference Code Tables'
	-	Deleted Tables 3-1, 3-2 (See REF-TA-1011)
	-	Added new Module Media code Tables 4-6,7,8,9,10
	-	Updated Module-Host Electrical Interface Codes Table 4-5
	-	Added codes for DSFP, x4 MiniLink/OCuLink, x8 MiniLink, QSFP with CMIS (Table 4-1)
	-	Reworded description of 0Dh code in Table 4-1
	-	Added text to note 2 in Table 4-1

	-	Added note 1 in Table 4-5
	-	Corrected BER from 2.4x10-6 to 2.6x10-6 in Table 4-9
	-	Added code for active cable with BER <10-6 in Table 4-9
Rev 4.7	-	*8-Jan-20*
	-	Changed editor's name and contact information
	-	Added missing abbreviation descriptions
	-	Changed XPAK name in the Abbreviation Section
	-	Added new specifications in Section 2.1 – Industry documents
	-	Formatted the reference to the document sources as a table in Section 2.2
	-	Made additions to the Module Form Factor Table 3-1
	-	In the overview in Section 4.1 corrected the referenced CMIS bytes and added the secondary Extended Specification Compliance byte location from SFF-8636
	-	Deleted lines for unused codes in Table 4-1
	-	Changed definition of value 26h in Table 4-3 to new connector name
	-	Added new codes 0Bh/0Ch/0Dh for 50GBASE-CR2 variants in Table 4-4
	-	Changed the names of codes 26h and 27h in Table 4-4
	-	Added new codes 41h/42h for CAUI-4 C2M and 43h/44h/45h for 50GBASE-CR2 in Table 4-5
	-	Changed the description of codes 3Dh-40h as per CMIS change in Table 4-5
	-	Changed definition for code 1Ah, 11h and 12h in Table 4-6
	-	Added new codes 40h/41h/42h for 50GBASE-ER/200GBASE-ER4/400GBASE-ER8 and codes 3Eh/3Fh for OIF Coherent modules in Table 4-7
	-	Edited definitions for OTN codes 2Ch-33h in Table 4-7
	-	Added new code 43h in Table 4-7 for 400GBASE-LR4-6, changed the name of 1Eh to 400G-LR4-10, changed the description of codes 15h,16h,1Dh
	-	Changed the titles for Tables 4-8 and 4-9 to include passive and active loopbacks and added new codes BFh for loopback modules
Rev 4.8	-	*30-Nov-20*
	-	Added new codes 0Eh, 28h, 29h, 2Ah, 2Bh, 3Fh, 47h, 48h, 49h for 10Mb/s in Table 4-4
	-	Deleted BER options for 100GBASE-FR1 and 100GBASE-LR1 in Table 4-4
	-	Added new code 79h for 256GFC and codes 80h and 81h for 64GFC and 128GFC in Table 4.4. Removed previous FC entries for codes 50h-55h
	-	Added new codes 70h, 71h, 72h, 73h and 74h in table 4-5. Added a note to point out some values in this table are rounded
	-	Changed "Application Name" header in Table 4-5 to "Specification"
	-	Changed B/sym to B/UI in the headers for Tables 4-5, 4-6, 4-7 and 4-10. Added UI in list of abbreviations
	-	Added rate entries for n100GBASE-CRn and family in Table 4-5
	-	Changed InfiniBand aggregate data rates to values to two decimal places
	-	Changed heading in Table 4-6 and Table 4-7 from "Application Name" to "Module Media Interface"
	-	Added new code 1Bh, modified the Application name for codes 0Dh and 11h in Table 4-6
	-	Corrected Signaling Rate for 100GBASE-SR in Table 4-6. Added rates for 800G-SR8.
	-	Added codes 44h and 45h in Table 4-7. Reclaimed codes for non-utilized Single mode media types 25h and 27h, reverted to Reserved
Rev 4.9	-	*24-May-21*
	-	Added codes 37h, 38h, 39h in Table 4-4 for 10GBASE-BR, 25GBASE-BR, 50GBASE-BR
	-	Added codes 78h, 79h and 80h in Table 4-7 for 10GBASE-BR, 25GBASE-BR, 50GBASE-BR
	-	Added Clause 167 to 100GBASE-SR family in Table 4-4

- Added code 36h for 100GBASE-VR in Table 4.4
- Added codes 1Dh, 1Eh and 1Fh for x00GBASE-VRx family in Table 4-6
- Added codes 2Ch, 2Dh, 2Eh, 2Fh, 34h, 35h in Table 4-4 for 100GBASE-LR and -ER family products. Added new codes in Table 4-7 4Ah, 4Bh and 4Ch
- Added code 4Ah for 50GBASE-ER in Table 4-4 and a note for the Fibre Channel codes
- Changed the column header for 4-5, 4-6, 4-7 and 4-10 to Application Bit Rate and the name for Table 4-5 to Host Electrical Interface ID
- Added codes 4Bh to 50h for 100GAUI-1-S and -L in Table 4-5
- Corrected names for 25GBASE-CR family in Table 4-5
- Moved entries for BASE-T from Table 4-5 to Table 4-10
- Corrected number of lanes for 400GBASE-SR8 in Table 4-6
- Added codes 46h to 49h Table 4-7 for OpenZR+ family
- Added code 4Dh in Table 4-7 and code 4Ch in Table 4-4 for 400GBASE-ZR
- Added P802.3cp, P802.3db, FC-PI-8 (draft?) in Section 2.1, Industry Documents
- Added Ethernet Technology Consortium in Table 2-1
- Changed the Application Bit Rate for codes 62 and 63 in Table 4-7 to 478.75.

Rev 4.10   *24-Nov-22*
- Added CMIS as option for SFP-DD in Table 3-1
- Modified description for code 1Ah in Table 4-1
- Added code 1Fh in Table 4-1
- Added Table 4-12 Fiber Face Type codes
- Added code 53h in Table 4-5, changed specification reference for code 49h in Table 4-5
- Added code 20h in Table 4-6
- Added codes 51h-58h in Table 4-7
- Added Table 4-11 Transceiver Sub-types Codes
- Changed 100GBASE-VR to 100GBASE-VR1 and 100GBASE-SR to 100GBASE-SR1
- Updated IEEE802.3 documents in 2.1 Industry documents
- Clarified AOC and ACC where used with retimer
- Added code 20h in Table 4-1, modified description for code 03h in Table 4-1
- Added Type 2B for QSFP in Table 4-11
- Added a CMIS option for SFP in Table 3-1.

Contents

Figures

Tables

1. Scope

This specification defines the SFF Module Management Reference Codes. This specification provides codes for module identifiers, encoding values, connector types, extended compliance codes, host electrical interface and module media interface. These codes are used to advertise module capabilities in a module memory map.

2. References, Conventions, Keywords, Definitions

2.1   Industry Documents

- 100G 4WDM-10 MSA Technical Specification
- 100G SWDM4 MSA Technical Specifications
- 100G-FR and 100G-LR Technical Specifications
- 25G & 50G Specification of the 25 Gigabit Ethernet Consortium
- 400G-FR4 Technical Specification
- 400G-LR4-10 Technical Specification
- 40G SWDM4 MSA Technical Specifications

- CLR4 - Replaced in the market by CWDM4 Technical Specification
- Common Management Interface Specification (CMIS)
- CPRI V7.0
- DSFP Module Specification
- IEEE Std 802.3, P802.3db, P802.3ck, P802.3cw, P802.3df
- INCITS 417 SAS-1.1 (Serial Attached SCSI - 1.1)
- INCITS 457 SAS-2   (Serial Attached SCSI - 2)
- INCITS 478 SAS-2.1 (Serial Attached SCSI - 2.1)
- INCITS 519 SAS-3   (Serial Attached SCSI - 3)
- INCITS 534 SAS-4   (Serial Attached SCSI - 4)
- INCITS FC-PI-4, FC-PI-5, FC-PI-6, FC-PI-6p, FC-PI-7, FC-PI-8 (draft)
- INF-8077   XFP 1X 10 Gb/s Pluggable Module
- INF-8438   QSFP 4X 4 Gb/s Transceiver (Quad SFP)
- InfiniBand Architecture Specification Volume 2
- ITU-T G.709/Y.1331
- ITU-T G.Sup58
- microQSFP Specification
- QSFP-DD Hardware Specification for QSFP Double Density 8X Pluggable Transceiver
- REF-TA-1011 Cross Reference to Select SFF Connectors and Modules
- SFF-8071   SFP+ 1X 0.8mm Card Edge Connector
- SFF-8081   SFP+ 1X 16 Gb/s Pluggable Transceiver Solution (SFP16)
- SFF-8083   SFP+ 1X 10 Gb/s Pluggable Transceiver Solution (SFP10)
- SFF-8084   SFP+ 1X 4 Gb/s Pluggable Transceiver Solution
- SFF-8402   SFP+ 1X 28 Gb/s Pluggable Transceiver Solution (SFP28)
- SFF-8418   SFP+ 10 Gb/s Electrical Interface
- SFF-8419   SFP+ Power and Low Speed Interface
- SFF-8432   SFP+ Module and Cage
- SFF-8433   SFP+ Ganged Cage
- SFF-8436   QSFP+ 4X 10 Gb/s Pluggable Transceiver
- SFF-8449   Management Interface for SAS Shielded Cables
- SFF-8472   Management Interface for SFP+
- SFF-8482   Serial Attachment 2X Unshielded Connector
- SFF-8613   Mini Multilane 4/8X Unshielded Connector (HDun)
- SFF-8614   Mini Multilane 4/8X Shielded Cage/Connector (HDsh)
- SFF-8617   Mini Multilane 12X Shielded Cage/Connector (CXP)
- SFF-8630   Serial Attachment 4X 12 Gb/s Unshielded Connector
- SFF-8635   QSFP+ 4X 10 Gb/s Pluggable Transceiver Solution (QSFP10)

- SFF-8636   Management Interface for 4-lane Modules and Cables
- SFF-8639   Multifunction 6X Unshielded Connector
- SFF-8640   Serial Attachment 4X 24 Gb/s Unshielded Connector
- SFF-8642   Mini Multilane 12X 10 Gb/s Shielded Connector (CXP10)
- SFF-8643   Mini Multilane 4/8X 12 Gb/s Unshielded Connector (HD12un)
- SFF-8644   Mini Multilane 4/8X 12 Gb/s Shielded Cage/Connector (HD12sh)
- SFF-8647   Mini Multilane 12X 14 Gb/s Shielded Cage/Connector (CXP14)
- SFF-8648   Mini Multilane 12X 28 Gb/s Shielded Cage/Connector (CXP28)
- SFF-8661   QSFP+ 4X Pluggable Module
- SFF-8662   QSFP+ 4X Connector (Style A)
- SFF-8663   QSFP+ Cage (Style A)
- SFF-8665   QSFP+ 4X 28 Gb/s Pluggable Transceiver Solution (QSFP28)
- SFF-8672   QSFP+ 4X Connector (Style B)
- SFF-8678   Serial Attachment 2X 6 Gb/s Unshielded Connector
- SFF-8679   QSFP+ 4X Base Electrical Specification
- SFF-8680   Serial Attachment 2X 12 Gb/s Unshielded Connector
- SFF-8681   Serial Attachment 2X 24 Gb/s Unshielded Connector
- SFF-8682   QSFP+ 4X Connector
- SFF-8683   QSFP+ Cage
- SFF-8685   QSFP+ 4X 14 Gb/s Pluggable Transceiver Solution (QSFP14)
- SFP-DD Hardware Specification for SFP Double Density 2X Pluggable transceiver
- SFP-DD Management interface specification
- Specification for OSFP

2.2   Sources

The complete list of SFF documents which have been completed, are currently being worked on, or that have been expired by the SFF Committee can be found at http://www.snia.org/sff/specifications. Suggestions for improvement of this specification will be welcome, they should be submitted to http://www.snia.org/feedback.

Copies of the standards and specifications can be obtained from the organizations' websites listed below:

Table 2-1 Sources for Industry Standards and Specifications

Standards and Specifications	Organization	Website
100G CWDM and 100G 4WDM Specifications	CWDM4 MSA	www.cwdm4-msa.org
100G-FR, 100G-LR, 400G-FR4 and 400G-LR4-10 Specifications	100G Lambda MSA	http://100glambda.com/
40G and 100G SWDM4 Specifications	SWDM Alliance	www.SWDM.org
DSFP and ACMIS Specifications	DSFP MSA	http://dsfpmsa.org/
Electronic Industry Alliance (EIA)	Electronic Components Industry Association (ECIA)	https://www.ecianow.org
IEEE 802 standards	Institute of Electrical and Electronics Engineers (IEEE)	https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68 or https://www.ieee.org
INCITS/Fibre Channel	International Committee for Information Technology Standards	http://www.techstreet.com/incitsgate.tmpl
InfiniBand	InfiniBand Trade Association (IBTA)	https://www.infinibandta.org
microQSFP Specification	microQSFP MSA	http://www.microqsfp.com/
OIF Implementation Agreements	Optical Internetworking Forum	https://www.oiforum.com
OSFP Specification	OSFP MSA	www.osfpmsa.org
PCIe	PCI-SIG	http://pcisig.com
QSFP-DD and CMIS Specifications	QSFP-DD MSA	http://www.qsfp-dd.com/
SAS	International Committee for Information Technology Standards (INCITS)	http://www.incits.org
SFP-DD and SFP-DD Management Specifications	SFP-DD MSA	www.sfp-dd.com
25G and 50G Specifications, 400G Auto-negotiation Specification for 400GBASE-CR8/KR8, 800 Gigabit Ethernet Specification	Ethernet Technology Consortium (formerly 25G Gigabit Ethernet Consortium)	https://ethernettechnologyconsortium.org/

2.3   Conventions

The following conventions are used throughout this document:
DEFINITIONS
Fanout Cable: A single connector cable assembly which splits into a number of connectors at the other end.

NUMBERING CONVENTIONS
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
1000	1 000	1 000
1,323,462.90	1 323 462,9	1 323 462.9

2.4   Keywords, Acronyms, and Definitions

For the purposes of this document, the following keywords, acronyms, and definitions apply.

2.4.1   Keywords

May/may not: A keyword that indicates flexibility of choice with no implied preference.

Obsolete: A keyword indicating that an item was defined in prior specifications but has been removed from this specification.

Reserved: A keyword used for defining the signal on a connector contact [when] its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields, and code values; the bits, bytes, fields, and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Shall: A keyword indicating a mandatory requirement. Designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

Should: A keyword indicating flexibility of choice with a strongly preferred alternative.

Vendor specific: A keyword indicating something (e.g., a bit, field, code value) that is not defined by this specification. Specification of the referenced item is determined by the manufacturer and may be used differently in various implementations.

2.4.2 Acronyms and Abbreviations

4WDM:	4 Wavelength Division Multiplexing
AOC:	Active optical cable
BNC:	Bayonet Neill-Concelman
CAUI:	100G Attachment Unit Interface
CDFP:	16 Lane Form Factor Pluggable Module
CLR4:	CLR4 alliance
CMIS:	Common Management Interface Specification
CS:	Corning/Senko
CXP:	100G 12 lane Pluggable Module
ACC:	Active Copper Cable
DSFP:	Dual Small Form Factor Pluggable
DWDM:	Dense Wavelength Division Multiplexing
GBIC:	Giga Bit Interface Converter
HSSDC:	High Speed Serial Data Connector
LC:	Lucent Connector
MPO:	Multi-fiber Push-On connector
MT-RJ:	Mechanical transfer registered jack connector
MU:	Miniature unit connector
MXC:	Multi-media eXtension Connector
OSFP:	Octal Small Form Factor Pluggable
PAM4:	Pulse Amplitude Modulation 4 levels
PSM4:	Parallel Single Mode 4 lane
QSFP:	Quad Small Form Factor Pluggable
QSFP-DD:	Quad Small Form Factor Pluggable Double Density
RJ45:	Registered jack 45 connector
SC:	Standard connector
SFI:	SFP+ high speed electrical interface
SFP:	Small Form Factor Pluggable
SFP-DD:	Small Form Factor Pluggable Double Density
SG:	Second generation connector
SWDM:	Shortwave wavelength division multiplexed
TNC:	Threaded Neill-Concelman
UI:	Unit Interval
X2:	10G Form Factor pluggable
XAUI:	10 lane Attachment Unit Interface
XENPAK:	10Gbit Ethernet transceiver Package
XFF:	(Obsolete)
XFF-E:	(Obsolete)
XFI:	XFP high speed electrical Interface
XFP:	10G Form Factor Pluggable
XPAK:	10G Form Factor pluggable transceiver package

2.4.3 Definitions

Connector: Each half of an interface that, when joined together, establish electrical contact and mechanical retention between two components. In this specification, the term connector does not apply to any specific gender; it is used to describe the receptacle, the plug or the card edge, or the union of receptacle to plug or card edge. Other common terms include: connector interface, mating interface, and separable interface.

Module: In this specification, module refers to:
1) an assembly that is terminated with a plug (See Figure 2-1
2)) at the end of a cable assembly (active or passive copper) or an active optical cable (AOC) intended to mate to a receptacle.

or

2) an optical transceiver typically inserted into a front panel socket that connects to the electrical interface of the system with a plug (See Figure 2-1) and the optical interface of the outside world.

Plug: A term used to describe the connector that contains the penetrating contacts of the connector interface as shown in Figure 2-1. Plugs typically contain stationary contacts. Other common terms include male, pin connector, and card edge.
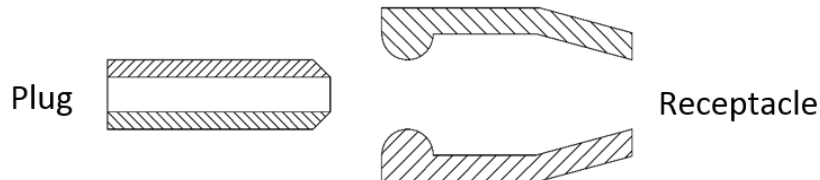
Figure 2-1 Plug and Receptacle Definition

Receptacle: A term used to describe the connector that contains the contacts that accept the plug contacts as shown in Figure 2-1. Receptacles typically contain spring contacts. Other common terms include female and socket connector.

3. General Description

3.1   Configuration Overview/Descriptions

This draft specification provides reference tables for pluggable modules. These tables are updated with additional codes reflecting industry developments.

Revisions 4.5 and earlier of this specification provided a tabular representation of pluggable I/O configurations along with the naming conventions that were used. This content is now provided in REF-TA-1011 "Cross Reference to Select SFF Connectors and Modules".

To request the addition of a code, send the following information to the contacts on page 1 of this document. The request should include the following:
1) Relevant table
2) Recommended information (form factor name, management interface name) to include in table
3) Publicly available reference specification e.g. data sheet or MSA specification

The relation between module form factors and management interface specifications is shown in Table 3-1.

Table 3-1 Module form factors and management interface specifications

Form factor	Management interface specification
SFP+/SFP28 and later	SFF-8472 or CMIS
QSFP+	SFF-8436
QSFP+/QSFP28 and later	SFF-8636 or CMIS
QSFP-DD/QSFP-DD800	CMIS
OSFP	CMIS
SFP-DD	SFP-DD Management interface specification or CMIS
MicroQSFP	SFF-8436

4. Transceiver or Cable Management

4.1   Overview

Self-identifying information is provided by modules or cables that use the 2-wire interface-based management interfaces listed in Table 3-1.

The information is kept current if the developers of new modules and the standards incorporating new speeds and technologies request updates to the tables.

The tables below are not static. They have been removed from the subject specifications (listed below) to prevent multi-revisions with no new technical content.

To request a new identifier (Table 4-1), encoding mechanism (Table 4-2), connector type (Table 4-3), compliance code (Table 4-4), host electrical interface code (Table 4-5) or module media interface code (Tables 4-6 to 4-10) please send an email request to points of contact listed on title page.

The tables below are referenced by the various specifications because either the content is common, or the contents are regularly updated. Maintaining the tables in SFF-8024 avoids having to revise specifications for non-technical changes. Examples of the registers for each table are shown here. In the event of a conflict between this list and the usage in any specification, that specification takes precedence.

> Table 4-1 Identifier Values
> > SFF-8472 A0h, Byte 0
> > SFF-8636 and CMIS Page 00h Byte 0 and Page 00h Byte 128
> Table 4-2 Encoding Values
> > SFF-8436, SFF-8636 00h Byte 139
> > SFF-8472 A0h Byte 11
> Table 4-3 Connector Types
> > SFF-8436, SFF-8636 Page 00h Byte 130
> > SFF-8472 A0h Byte 2
> > CMIS Page 00h Byte 203
> Table 4-4 Extended Specification Compliance Codes
> > SFF-8636 Page 00h Byte 192 and Page 00h Byte 116
> > SFF-8472 A0h Byte 36
> Table 4-11 Transceiver Sub-type codes
> > SFF-8636 Page 00h, Byte 117
> Table 4-12 Fiber Face Type Codes
> > SFF-8636 Page 00h, Byte 117

The following tables provide codes for the various host electrical interface and optical or other media interface specifications that may apply to pluggable modules. Separate codes for the electrical and media interfaces enable modules to identify the specific combination of electrical and media specifications that the module supports. Codes for publicly available networking industry specifications are included.

> Table 4-5 Host Electrical Interface Codes
> > CMIS lower page, bytes 86, 90, 94, 98, 102, 106, 110, and 114
> Table 4-6 to Table 4-10 Module Media Interface Codes
> > CMIS lower page, bytes 87, 91, 95, 99, 103, 107, 111, and 115

4.2   Transceiver References

The Identifier Value assigned to the combination of memory map and module is essential to interpreting the contents of the memory map.

Table 4-1 Identifier Values

Value	Description of Module, with memory map type if not unique
00h	Unknown or unspecified
01h	GBIC
02h	Module/connector soldered to motherboard (using SFF-8472)
03h	SFP/SFP+/SFP28 and later with SFF-8472 management interface
04h	300 pin XBI
05h	XENPAK
06h	XFP
07h	XFF
08h	XFP-E
09h	XPAK
0Ah	X2
0Bh	DWDM-SFP/SFP+ (not using SFF-8472)
0Ch	QSFP (INF-8438)
0Dh	QSFP+ or later with SFF-8636 or SFF-8436 management interface (SFF-8436, SFF-8635, SFF-8665, SFF-8685 et al.) [1]
0Eh	CXP or later
0Fh	Shielded Mini Multilane HD 4X
10h	Shielded Mini Multilane HD 8X
11h	QSFP28 or later with SFF-8636 management interface (SFF-8665 et al.) [2]
12h	CXP2 (aka CXP28) or later
13h	CDFP (Style 1/Style2)
14h	Shielded Mini Multilane HD 4X Fanout Cable
15h	Shielded Mini Multilane HD 8X Fanout Cable
16h	CDFP (Style 3)
17h	microQSFP
18h	QSFP-DD Double Density 8X Pluggable Transceiver (INF-8628)
19h	OSFP 8X Pluggable Transceiver
1Ah	SFP-DD Double Density 2X Pluggable Transceiver with SFP-DD Management Interface Specification
1Bh	DSFP Dual Small Form Factor Pluggable Transceiver
1Ch	x4 MiniLink/OcuLink
1Dh	x8 MiniLink
1Eh	QSFP+ or later with Common Management Interface Specification (CMIS)
1Fh	SFP-DD Double Density 2X Pluggable Transceiver with Common Management Interface Specification (CMIS)
20h	SFP+ and later with Common Management Interface Specification (CMIS)
21h-7Fh	Reserved
80-FFh	Vendor Specific
1. 0Dh is the preferred coding, it supports multi-speed implementations and provides backward compatibility	
2. 11h may prevent the use of new 25G-class modules on old hosts. Not recommended for new designs	

NOTE: The Identifier Values assigned by the CFP MSA overlap with the above, and this should not be an issue because CFP does not use I2C for the management protocol, it uses MDIO. Software which bases actions on Identifier Values needs to recognize that synonyms exist and qualify the values by the management protocol.

For some transceiver types, an additional sub-type identifier can be used to provide information to the host on mechanical and thermal implementation. Codes are listed in Table 4-11 for each type of transceiver. Refer to the

hardware specifications for more information on the listed sub-types.

4.3   Encoding References

The values established by SFF-8436 and SFF-8636 are similar but not identical to those assigned by SFF-8472. Maintaining a single reference will prevent further divergence.
Encoding values are primarily intended for the host interface.

Table 4-2 Encoding Values

Description of Encoding mechanism	Modules		
	8472	**Common**	**8436/8636**
Unspecified		00h	
8B/10B		01h	
4B/5B		02h	
NRZ		03h	
Manchester	04h		06h
SONET Scrambled	05h		04h
64B/66B	06h		05h
256B/257B (transcoded FEC-enabled data)		07h	
PAM4		08h	
Reserved		09h-FFh	
Note: For modules supporting multiple encoding types, the primary product application dictates the value chosen e.g. for Fibre Channel 16G/8G/4G or Ethernet 10G/1G, the value of 64B/66B should be chosen. In case of a conflict between modulation and coding, use the code for modulation. E.g., for 200GAUI-4 use code for PAM4.			

4.4 Connector References

The media side connector codes listed in Table 4-3 are used by SFF-8436, SFF-8472, SFF-8636 and CMIS management interfaces. Maintaining a single reference will prevent divergence.

When applicable, the codes listed in Table 4-12 are used to identify the fiber face type for the specific connector type.

Table 4-3 Connector Types

Value	Description of Media Connector
00h	Unknown or unspecified
01h	SC (Subscriber Connector)
02h	Fibre Channel Style 1 copper connector
03h	Fibre Channel Style 2 copper connector
04h	BNC/TNC (Bayonet/Threaded Neill-Concelman)
05h	Fibre Channel coax headers
06h	Fiber Jack
07h	LC (Lucent Connector)
08h	MT-RJ (Mechanical Transfer – Registered Jack)
09h	MU (Multiple Optical)
0Ah	SG
0Bh	Optical Pigtail
0Ch	MPO 1x12 (Multifiber Parallel Optic)
0Dh	MPO 2x16
0Eh-1Fh	Reserved
20h	HSSDC II (High Speed Serial Data Connector)
21h	Copper pigtail
22h	RJ45 (Registered Jack)
23h	No separable connector
24h	MXC 2x16
25h	CS optical connector
26h	SN (previously Mini CS) optical connector
27h	MPO 2x12
28h	MPO 1x16
29h-7Fh	Reserved
80h-FFh	Vendor specific

4.5 Extended Specification Compliance References

The Extended Specification Compliance Codes identify the electronic or optical interfaces which are not included in SFF-8472 Optical and Cable Variants Specification Compliance or SFF-8636 Specification Compliance Codes. A multi-lane pluggable module may support more than a single instantiation of the specified compliance code.
Linear copper cables are identified by the code for the equivalent passive copper cable.

Table 4-4 Extended Specification Compliance Codes

Code	Description of Module Capability
00h	Unspecified
01h	100G AOC (Active Optical Cable), retimed or 25GAUI C2M AOC. Providing a worst BER of 5×10^{-5}
02h	100GBASE-SR4 or 25GBASE-SR
03h	100GBASE-LR4 or 25GBASE-LR
04h	100GBASE-ER4 or 25GBASE-ER
05h	100GBASE-SR10
06h	100G CWDM4
07h	100G PSM4 Parallel SMF
08h	100G ACC (Active Copper Cable), retimed or 25GAUI C2M ACC. Providing a worst BER of 5×10^{-5}
09h	Obsolete (assigned before 100G CWDM4 MSA required FEC)
0Ah	Reserved
0Bh	100GBASE-CR4, 25GBASE-CR CA-25G-L or 50GBASE-CR2 with RS (Clause91) FEC
0Ch	25GBASE-CR CA-25G-S or 50GBASE-CR2 with BASE-R (Clause 74 Fire code) FEC
0Dh	25GBASE-CR CA-25G-N or 50GBASE-CR2 with no FEC
0Eh	10 Mb/s Single Pair Ethernet (802.3cg, Clause 146/147, 1000 m copper)
0Fh	Reserved
10h	40GBASE-ER4
11h	4 x 10GBASE-SR
12h	40G PSM4 Parallel SMF
13h	G959.1 profile P1I1-2D1 (10709 MBd, 2km, 1310 nm SM)
14h	G959.1 profile P1S1-2D2 (10709 MBd, 40km, 1550 nm SM)
15h	G959.1 profile P1L1-2D2 (10709 MBd, 80km, 1550 nm SM)
16h	10GBASE-T with SFI electrical interface
17h	100G CLR4
18h	100G AOC, retimed or 25GAUI C2M AOC. Providing a worst BER of 10^{-12} or below
19h	100G ACC, retimed or 25GAUI C2M ACC. Providing a worst BER of 10^{-12} or below
1Ah	100GE-DWDM2 (DWDM transceiver using 2 wavelengths on a 1550 nm DWDM grid with a reach up to 80 km)
1Bh	100G 1550nm WDM (4 wavelengths)
1Ch	10GBASE-T Short Reach (30 meters)
1Dh	5GBASE-T
1Eh	2.5GBASE-T
1Fh	40G SWDM4
20h	100G SWDM4

Code	Description of Module Capability
21h	100G PAM4 BiDi
Code	**Description of Module Capability**
37h	10GBASE-BR (Clause 158)[2]
38h	25GBASE-BR (Clause 159)[2]
39h	50GBASE-BR (Clause 160)[2]
22h	4WDM-10 MSA (10km version of 100G CWDM4 with same RS(528,514) FEC in host system)
23h	4WDM-20 MSA (20km version of 100GBASE-LR4 with RS(528,514) FEC in host system)
24h	4WDM-40 MSA (40km reach with APD receiver and RS(528,514) FEC in host system)
25h	100GBASE-DR (Clause 140), CAUI-4 (no FEC)
26h	100G-FR or 100GBASE-FR1 (Clause 140), CAUI-4 (no FEC on host interface)
27h	100G-LR or 100GBASE-LR1 (Clause 140), CAUI-4 (no FEC on host interface)
28h	100GBASE-SR1 (P802.3db, Clause 167), CAUI-4 (no FEC on host interface)
3Ah	100GBASE-VR1 (P802.3db, Clause 167), CAUI-4 (no FEC on host interface)
29h	100GBASE-SR1, 200GBASE-SR2 or 400GBASE-SR4 (P802.3db, Clause 167)
36h	100GBASE-VR1, 200GBASE-VR2 or 400GBASE-VR4 (P802.3db, Clause 167)
2Ah	100GBASE-FR1 (P802.3cu, Clause 140)
2Bh	100GBASE-LR1 (P802.3cu, Clause 140)
2Ch	100G-LR1-20 MSA, CAUI-4 (no FEC on host interface)
2Dh	100G-ER1-30 MSA, CAUI-4 (no FEC on host interface)
2Eh	100G-ER1-40 MSA, CAUI-4 (no FEC on host interface)
2Fh	100G-LR1-20 MSA
34h	100G-ER1-30 MSA
35h	100G-ER1-40 MSA
30h	Active Copper Cable with 50GAUI, 100GAUI-2 or 200GAUI-4 C2M. Providing a worst BER of 10^{-6} or below
31h	Active Optical Cable with 50GAUI, 100GAUI-2 or 200GAUI-4 C2M. Providing a worst BER of 10^{-6} or below
32h	Active Copper Cable with 50GAUI, 100GAUI-2 or 200GAUI-4 C2M. Providing a worst BER of 2.6×10^{-4} for ACC, 10^{-5} for AUI, or below
33h	Active Optical Cable with 50GAUI, 100GAUI-2 or 200GAUI-4 C2M. Providing a worst BER of 2.6×10^{-4} for AOC, 10^{-5} for AUI, or below
3Bh – 3Eh	Reserved
3Fh	100GBASE-CR1, 200GBASE-CR2 or 400GBASE-CR4 (P802.3ck, Clause 162)
40h	50GBASE-CR, 100GBASE-CR2, or 200GBASE-CR4
41h	50GBASE-SR, 100GBASE-SR2, or 200GBASE-SR4
42h	50GBASE-FR or 200GBASE-DR4
4Ah	50GBASE-ER (IEEE 802.3, Clause 139)
43h	200GBASE-FR4
44h	200G 1550 nm PSM4
45h	50GBASE-LR
46h	200GBASE-LR4

47h	400GBASE-DR4 (802.3, Clause 124), 100GAUI-1 C2M (Annex 120G)
48h	400GBASE-FR4 (802.3, Clause 151)
49h	400GBASE-LR4-6 (802.3, Clause 151)
4Bh	400G-LR4-10
4Ch	400GBASE-ZR (P802.3cw, Clause 156)
4Dh – 7Eh	Reserved
7Fh	256GFC-SW4 (FC-PI-7P)
80h	64GFC (FC-PI-7)[1]
81h	128GFC (FC-PI-8)[1]
82h - FFh	Reserved

1. Not to be used for single lane application devices based on SFF-8472. Fibre Channel speeds are advertised in register 10 and 62, A0h
2. BR code names need link length value and laser wavelength defined direction (up or down-stream) to completely specify transceiver capabilities

4.6   Host Electrical and Media Interface IDs

The following tables provide codes for the various electrical interface and optical or other media interface specifications that may apply to pluggable modules. Separate codes for the electrical and media interfaces enable modules to identify the specific combination of electrical and media specifications that the module supports. Codes for all publicly available networking industry specifications should be included.

Note: The codes are not listed in numerical order

Table 4-5 Host Electrical Interface IDs

ID	ID (Hex)	Host Electrical Interface (Specification Reference)	Application Bit Rate, Gb/s^2	Lane Count	Lane Signaling Rate, GBd^2	Modula-tion	b/ UI
0	0	Undefined					
		Ethernet					
1	1	1000BASE-CX (Clause 39)	1.25	1	1.25	NRZ	1
2	2	XAUI (Clause 47)	12.50	4	3.125	NRZ	1
3	3	XFI (SFF INF-8071i)	9.95-11.18	1	9.95-11.18	NRZ	1
4	4	SFI (SFF-8431)	9.95-11.18	1	9.95-11.18	NRZ	1
5	5	25GAUI C2M (Annex 109B)	25.78	1	25.78125	NRZ	1
6	6	XLAUI C2M (Annex 83B)	41.25	4	10.3125	NRZ	1
7	7	XLPPI (Annex 86A)	41.25	4	10.3125	NRZ	1
8	8	LAUI-2 C2M (Annex 135C)	51.56	2	25.78125	NRZ	1
9	9	50GAUI-2 C2M (Annex 135E)	53.13	2	26.5625	NRZ	1
10	A	50GAUI-1 C2M (Annex 135G)	53.13	1	26.5625	PAM4	2
11	B	CAUI-4 C2M (Annex 83E)[1]	103.13	4	25.78125	NRZ	1
65	41	CAUI-4 C2M (Annex 83E) without FEC	103.13	4	25.78125	NRZ	1
66	42	CAUI-4 C2M (Annex 83E) with RS(528,514) FEC	103.13	4	25.78125	NRZ	1
12	C	100GAUI-4 C2M (Annex 135E)	106.25	4	26.5625	NRZ	1
13	D	100GAUI-2 C2M (Annex 135G)	106.25	2	26.5625	PAM4	2
75	4B	100GAUI-1-S C2M (Annex 120G)	106.25	1	53.125	PAM4	2
76	4C	100GAUI-1-L C2M (Annex 120G)	106.25	1	53.125	PAM4	2
14	E	200GAUI-8 C2M (Annex 120C)	212.50	8	26.5625	NRZ	1
15	F	200GAUI-4 C2M (Annex 120E)	212.50	4	26.5625	PAM4	2
77	4D	200GAUI-2-S C2M (Annex 120G)	212.50	2	53.125	PAM4	2
78	4E	200GAUI-2-L C2M (Annex 120G)	212.50	2	53.125	PAM4	2
16	10	400GAUI-16 C2M (Annex 120C)	425.00	16	26.5625	NRZ	1
17	11	400GAUI-8 C2M (Annex 120E)	425.00	8	26.5625	PAM4	2
79	4F	400GAUI-4-S C2M (Annex 120G)	425.00	4	53.125	PAM4	2
80	50	400GAUI-4-L C2M (Annex 120G)	425.00	4	53.125	PAM4	2
81	51	800G S C2M (placeholder)	850.00	8	53.125	PAM4	2
82	52	800G L C2M (placeholder)	850.00	8	53.125	PAM4	2
18	12	Reserved					
19	13	10GBASE-CX4 (Clause 54)	12.50	4	3.125	NRZ	1
20	14	25GBASE-CR CA-25G-L (Clause 110)	25.78	1	25.78125	NRZ	1

ID	ID (Hex)	Host Electrical Interface (Specification Reference)	Application Bit Rate, Gb/s[2]	Lane Count	Lane Signaling Rate, GBd[2]	Modula-tion	b/ UI
21	15	25GBASE-CR or 25GBASE-CR-S CA-25G-S (Clause 110)	25.78	1	25.78125	NRZ	1
22	16	25GBASE-CR or 25GBASE-CR-S CA-25G-N (Clause 110)	25.78	1	25.78125	NRZ	1
23	17	40GBASE-CR4 (Clause 85)	41.25	4	10.3125	NRZ	1
67	43	50GBASE-CR2 (Ethernet Technology Consortium) with RS(528,514) (Clause 91) FEC	51.56	2	25.78125	NRZ	1
68	44	50GBASE-CR2 (Ethernet Technology Consortium) with BASE-R (Clause 74), Fire code FEC	51.56	2	25.78125	NRZ	1
69	45	50GBASE-CR2 (Ethernet Technology Consortium) with no FEC	51.56	2	25.78125	NRZ	1
24	18	50GBASE-CR (Clause 136)	53.13	1	26.5625	PAM4	2
25	19	100GBASE-CR10 (Clause 85)	103.13	10	10.3125	NRZ	1
26	1A	100GBASE-CR4 (Clause 92)	103.13	4	25.78125	NRZ	1
27	1B	100GBASE-CR2 (Clause 136)	106.25	2	26.5625	PAM4	2
70	46	100GBASE-CR1 (Clause 162)	106.25	1	53.125	PAM4	2
28	1C	200GBASE-CR4 (Clause 136)	212.50	4	26.5625	PAM4	2
71	47	200GBASE-CR2 (Clause 162)	212.50	2	53.125	PAM4	2
29	1D	400G CR8 (Ethernet Technology Consortium)	425.00	8	26.5625	PAM4	2
72	48	400GBASE-CR4 (Clause 162)	425.00	4	53.125	PAM4	2
73	49	800G-ETC-CR8	850.00	8	53.125	PAM4	2
		Fibre Channel					
37	25	8GFC (FC-PI-4)	8.50	1	8.500	NRZ	1
38	26	10GFC (10GFC)	10.52	1	10.51875	NRZ	1
39	27	16GFC (FC-PI-5)	14.03	1	14.025	NRZ	1
40	28	32GFC (FC-PI-6)	28.05	1	28.050	NRZ	1
41	29	64GFC (FC-PI-7)	57.80	1	28.900	PAM4	2
74	4A	128GFC (FC-PI-8)		1		PAM4	2
42	2A	128GFC (FC-PI-6P)	112.20	4	28.050	NRZ	1
43	2B	256GFC (FC-PI-7P)	231.20	4	28.900	PAM4	2
		InfiniBand					
44	2C	IB SDR (Arch.Spec.Vol.2)	2.5 - 30	1, 2, 4, 8, 12	2.5	NRZ	1
45	2D	IB DDR (Arch.Spec.Vol.2)	5.0 - 60	1, 2, 4, 8, 12	5.0	NRZ	1
46	2E	IB QDR (Arch.Spec.Vol.2)	10 - 120	1, 2, 4, 8, 12	10.0	NRZ	1
47	2F	IB FDR (Arch.Spec.Vol.2)	14.06 – 168.75	1, 2, 4, 8, 12	14.0625	NRZ	1
48	30	IB EDR (Arch.Spec.Vol.2)	25.78 – 309.38	1, 2, 4, 8, 12	25.78125	NRZ	1

ID	ID (Hex)	Host Electrical Interface (Specification Reference)	Application Bit Rate, Gb/s[2]	Lane Count	Lane Signaling Rate, GBd[2]	Modula-tion	b/ UI
49	31	IB HDR (Arch.Spec.Vol.2)	53.13 – 637.5	1, 2, 4, 8, 12	26.5625	PAM4	2
50	32	IB NDR	106.25 – 1275	4,12	53.125	PAM4	2
		CPRI					
51	33	E.96 (CPRI Specification V7.0)	9.83	1	9.8304	NRZ	1
52	34	E.99 (CPRI Specification V7.0)	10.14	1	10.1376	NRZ	1
53	35	E.119 (CPRI Specification V7.0)	12.17	1	12.16512	NRZ	1
54	36	E.238 (CPRI Specification V7.0)	24.33	1	24.33024	NRZ	1
		OTN(ITU-T)					
55	37	OTL3.4 (ITU-T G.709/Y.1331 G.Sup58) See XLAUI (overclocked)	43	4	10.7546	NRZ	1
56	38	OTL4.10 (ITU-T G.709/Y.1331 G.Sup58) See CAUI-10 (overclocked)	112	10	11.1810	NRZ	1
83	53	OTL4.2	112	2	27.9525	PAM4	2
57	39	OTL4.4 (ITU-T G.709/Y.1331 G.Sup58) See CEI-28G-VSR	112	4	27.9525	NRZ	1
58	3A	OTLC.4 (ITU-T G.709.1/Y.1331 G.Sup58) See CEI-28G-VSR	112	4	28.0762	NRZ	1
59	3B	FOIC1.4 (ITU-T G.709.1/Y.1331 G.Sup58) See CEI-28G-VSR	112	4	27.9524	NRZ	1
60	3C	FOIC1.2 (ITU-T G.709.1/Y.1331 G.Sup58) See CEI-56G-VSR-PAM4	112	2	27.9524	PAM4	2
61	3D	FOIC2.8 (ITU-T G.709.1/Y.1331 G.Sup58) See CEI-28G-VSR	224	8	27.9523	NRZ	1
62	3E	FOIC2.4 (ITU-T G.709.1/Y.1331 G.Sup58) See CEI-56G-VSR-PAM4	224	4	27.9523	PAM4	2
63	3F	FOIC4.16 (ITU-T G.709.1 G.Sup58) See CEI-28G-VSR	447	16	27.9523	NRZ	1
64	40	FOIC4.8 (ITU-T G.709.1 G.Sup58) See CEI-56G-VSR-PAM4	447	8	27.9523	PAM4	2
30-36	1E-24	Reserved					
84-191	54-BF	Reserved					
192-254	C0-FE	Vendor Specific/Custom					
255	FF	End of list					

Notes:
1. Not recommended for new designs. New codes 65 and/or 66 should be used
2. In some instances, in this table values for Application Data Rate and Lane Signaling Rate have been rounded off. Please refer to the listed standards for exact values.

Table 4-6 MMF media interface IDs

ID	ID (Hex)	MM Media Interface (Specification Reference)	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
0	0	Undefined					
		Ethernet					
1	1	10GBASE-SW (Clause 52)	9.95	1	9.95328	NRZ	1
2	2	10GBASE-SR (Clause 52)	10.31	1	10.3125	NRZ	1
3	3	25GBASE-SR (Clause 112)	25.78	1	25.78125	NRZ	1
4	4	40GBASE-SR4 (Clause 86)	41.25	4	10.3125	NRZ	1
5	5	40GE SWDM4 MSA Spec	41.25	4	10.3125	NRZ	1
6	6	40GE BiDi	41.25	2	20.625	NRZ	1
7	7	50GBASE-SR (Clause 138)	53.13	1	26.5625	PAM4	2
8	8	100GBASE-SR10 (Clause 86)	103.13	10	10.3125	NRZ	1
9	9	100GBASE-SR4 (Clause 95)	103.13	4	25.78125	NRZ	1
10	A	100GE SWDM4 MSA Spec	103.13	4	25.78125	NRZ	1
11	B	100GE BiDi	106.25	2	25.5625	PAM4	2
12	C	100GBASE-SR2 (Clause 138)	106.25	2	26.5625	PAM4	2
13	D	100GBASE-SR1 (Clause 167)	106.25	1	53.125	PAM4	2
29	1D	100GBASE-VR1 (Clause 167)	106.25	1	53.125	PAM4	2
14	E	200GBASE-SR4 (Clause 138)	212.50	4	26.5625	PAM4	2
27	1B	200GBASE-SR2 (Clause 167)	212.50	2	53.125	PAM4	2
30	1E	200GBASE-VR2 (Clause 167)	212.50	2	53.125	PAM4	2
15	F	400GBASE-SR16 (Clause 123)	425.00	16	26.5625	NRZ	1
16	10	400GBASE-SR8 (Clause 138)	425.00	8	26.5625	PAM4	2
17	11	400GBASE-SR4 (Clause 167)	425.00	4	53.125	PAM4	2
31	1F	400GBASE-VR4 (Clause 167)	425.00	4	53.125	PAM4	2
18	12	800GBASE-SR8 (Placeholder)	850.00	8	53.125	PAM4	2
32	20	800GBASE-VR8 (Placeholder)	850.00	8	53.125	PAM4	2
26	1A	400GBASE-SR4.2 (Clause 150) (400GE BiDi)	425.00	8	26.5625	PAM4	2
		Fibre Channel					
19	13	8GFC-MM (FC-PI-4)	8.50	1	8.500	NRZ	1
20	14	10GFC-MM (10GFC)	10.52	1	10.51875	NRZ	1
21	15	16GFC-MM (FC-PI-5)	14.03	1	14.025	NRZ	1
22	16	32GFC-MM (FC-PI-6)	28.05	1	28.050	NRZ	1
23	17	64GFC-MM (FC-PI-7)	57.80	1	28.900	PAM4	2
28	1C	128GFC-MM (FC-PI-8)		1		PAM4	2
24	18	128GFC-MM4 (FC-PI-6P)	112.20	4	28.050	NRZ	1
25	19	256GFC-MM4 (FC-PI-7P)	231.20	4	28.900	PAM4	2
33-191	21-BF	Reserved					
192-255	C0-FF	Vendor Specific/Custom					

Table 4-7 SMF media interface IDs

ID	ID (Hex)	SM Media Interface (Specification Reference)	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
0	0	Undefined					
		Ethernet					
1	1	10GBASE-LW (Clause 52)	9.95	1	9.95328	NRZ	1
2	2	10GBASE-EW (Clause 52)	9.95	1	9.953	NRZ	1
3	3	10G-ZW	9.95	1	9.953	NRZ	1
4	4	10GBASE-LR (Clause 52)	10.31	1	10.3125	NRZ	1
5	5	10GBASE-ER (Clause 52)	10.31	1	10.3125	NRZ	1
78	4E	10GBASE-BR (Clause 158)[1]	10.31	1	10.3125	NRZ	1
6	6	10G-ZR	10.31	1	10.3125	NRZ	1
7	7	25GBASE-LR (Clause 114)	25.78	1	25.78125	NRZ	1
8	8	25GBASE-ER (Clause 114)	25.78	1	25.78125	NRZ	1
79	4F	25GBASE-BR (Clause 159)[1]	25.78	1	25.78125	NRZ	1
9	9	40GBASE-LR4 (Clause 87)	41.25	4	10.3125	NRZ	1
10	A	40GBASE-FR (Clause 89)	41.25	1	41.25	NRZ	1
11	B	50GBASE-FR (Clause 139)	53.13	1	26.5625	PAM4	2
12	C	50GBASE-LR (Clause 139)	53.13	1	26.5625	PAM4	2
64	40	50GBASE-ER (Clause 139)	53.13	1	26.5625	PAM4	2
80	50	50GBASE-BR (Clause 160)[1]	53.13	1	26.5625	PAM4	2
13	D	100GBASE-LR4 (Clause 88)	103.13	4	25.78125	NRZ	1
14	E	100GBASE-ER4 (Clause 88)	103.13	4	25.78125	NRZ	1
15	F	100G PSM4 MSA Spec	103.13	4	25.78125	NRZ	1
52	34	100G CWDM4-OCP	103.13	4	25.78125	NRZ	1
16	10	100G CWDM4 MSA Spec	103.13	4	25.78125	NRZ	1
17	11	100G 4WDM-10 MSA Spec	103.13	4	25.78125	NRZ	1
18	12	100G 4WDM-20 MSA Spec	103.13	4	25.78125	NRZ	1
19	13	100G 4WDM-40 MSA Spec	103.13	4	25.78125	NRZ	1
20	14	100GBASE-DR (Clause 140)	106.25	1	53.125	PAM4	2
21	15	100G-FR MSA spec[2]/100GBASE-FR1 (Clause 140)	106.25	1	53.125	PAM4	2
22	16	100G-LR MSA spec[2]/100GBASE-LR1 (Clause 140)	106.25	1	53.125	PAM4	2
74	4A	100G-LR1-20 MSA Spec[2]	106.25	1	53.125	PAM4	2
75	4B	100G-ER1-30 MSA Spec[2]	106.25	1	53.125	PAM4	2
76	4C	100G-ER1-40 MSA Spec[2]	106.25	1	53.125	PAM4	2
68	44	100GBASE-ZR (Clause 154)	111.81	1	27.9525	DP-QPSK	4
23	17	200GBASE-DR4 (Clause 121)	212.50	4	26.5625	PAM4	2
24	18	200GBASE-FR4 (Clause 122)	212.50	4	26.5625	PAM4	2
25	19	200GBASE-LR4 (Clause 122)	212.50	4	26.5625	PAM4	2
65	41	200GBASE-ER4 (Clause 122)	212.50	4	26.5625	PAM4	2
26	1A	400GBASE-FR8 (Clause 122)	425.00	8	26.5625	PAM4	2
27	1B	400GBASE-LR8 (Clause 122)	425.00	8	26.5625	PAM4	2
66	42	400GBASE-ER8 (Clause 122)	425.00	8	26.5625	PAM4	2

ID	ID (Hex)	SM Media Interface (Specification Reference)	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
28	1C	400GBASE-DR4 (Clause 124)	425.00	4	53.125	PAM4	2
85	55	400GBASE-DR4-2 (placeholder)	425.00	4	53.125	PAM4	2
29	1D	400G-FR4 MSA spec[2]/400GBASE-FR4 (Clause 151)	425.00	4	53.125	PAM4	2
67	43	400GBASE-LR4-6 (Clause 151)	425.00	4	53.125	PAM4	2
30	1E	400G-LR4-10 MSA Spec[2]	425.00	4	53.125	PAM4	2
77	4D	400GBASE-ZR (Clause 156)	478.75	1	59.84375	DP-16QAM	8
86	56	800GBASE-DR8 (placeholder)	850.00	8	53.125	PAM4	2
87	57	800GBASE-DR8-2 (placeholder)	850.00	8	53.125	PAM4	2
		Fibre Channel					
31	1F	8GFC-SM (FC-PI-4)	8.50	1	8.500	NRZ	1
32	20	10GFC-SM (10GFC)	10.52	1	10.51875	NRZ	1
33	21	16GFC-SM (FC-PI-5)	14.03	1	14.025	NRZ	1
34	22	32GFC-SM (FC-PI-6)	28.05	1	28.050	NRZ	1
35	23	64GFC-SM (FC-PI-7)	57.80	1	28.900	PAM4	2
69	45	128GFC-SM (FC-PI-8)		1		PAM4	2
36	24	128GFC-PSM4 (FC-PI-6P)	112.20	4	28.050	NRZ	1
38	26	128GFC-CWDM4 (FC-PI-6P)	112.20	4	28.050	NRZ	1
37, 39-43	25, 27-2B	Reserved					
		OTN(ITU-T)					
44	2C	4I1-9D1F (G.959.1)	112	4	28	NRZ	1
45	2D	4L1-9C1F (G.959.1)	112	4	28	NRZ	1
46	2E	4L1-9D1F (G.959.1)	112	4	28	NRZ	1
47	2F	C4S1-9D1F (G.695)	112	4	28	NRZ	1
48	30	C4S1-4D1F (G.695)	224	4	27.9523	PAM4	2
49	31	4I1-4D1F (G.959.1)	224	4	27.9523	PAM4	2
50	32	8R1-4D1F (G.959.1)	447	8	27.9523	PAM4	2
51	33	8I1-4D1F (G.959.1)	447	8	27.9523	PAM4	2
81	51	FOIC1.4-DO (G.709.3/Y.1331.3)[3]	126.28	1	31.5697	DP-QPSK	4
82	52	FOIC2.8-DO (G.709.3/Y.1331.3)[3]	252.56	1	31.5697	DP-16QAM	8
83	53	FOIC4.8-DO (G.709.3/Y.1331.3)[3]	505.12	1	63.1395	DP-16QAM	8
84	54	FOIC2.4-DO (G.709.3/Y.1331.3)[3]	252.56	1	63.1395	DP-QPSK	4
		CPRI					
56	38	10G-SR	9.8304	1	9.8304	NRZ	1
57	39	10G-LR	9.8304	1	9.8304	NRZ	1
58	3A	25G-SR	24.33024	1	24.33024	NRZ	1
59	3B	25G-LR	24.33024	1	24.33024	NRZ	1
60	3C	10G-LR-BiDi	9.8304	1	9.8304	NRZ	1
61	3D	25G-LR-BiDi	24.33024	1	24.33024	NRZ	1

ID	ID (Hex)	SM Media Interface (Specification Reference)	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
		OIF					
62	3E	400ZR, DWDM, amplified	478.75	1	59.84375	DP-16QAM	8
63	3F	400ZR, Single Wavelength, Unamplified	478.75	1	59.84375	DP-16QAM	8
		OpenZR+					
70	46	ZR400-OFEC-16QAM	481.108374	1	60.1385468	DP-16QAM	8
71	47	ZR300-OFEC-8QAM	360.831281	1	60.1385468	DP-8QAM	6
72	48	ZR200-OFEC-QPSK	240.554187	1	60.1385468	DP-QPSK	4
73	49	ZR100-OFEC-QPSK	120.277094	1	30.069273	DP-QPSK	4
53-55	35-37	Reserved					
88-191	58-BF	Reserved					
192-255	C0-FF	Vendor Specific/Custom					
1. BR code names need link length value and laser wavelength defined direction (up or down-stream) to completely specify transceiver capabilities 2. 100G Lambda MSA. 3. Optical specifications for these codes are being developed in few standards organizations. Refer to vendor specification for more information on compliance.							

Table 4-8 Passive and Linear Active Copper Cable and Passive Loopback media interface codes

ID	Code (Hex)	Application Name
0	0	Undefined
1	1	Copper cable
2-190	2-BE	Reserved
191	BF	Passive Loopback module
192-255	C0-FF	Vendor Specific/Custom

Note: Details for the cable assembly interface are defined using the host electrical interface codes in Table 4-5.

Table 4-9 Limiting and Retimed Active Cable assembly and Active Loopback media interface codes

ID	Code (Hex)	Application Name
0	0	Undefined
1	1	Active Cable assembly with BER < 10^{-12}
2	2	Active Cable assembly with BER < 5×10^{-5}
3	3	Active Cable assembly with BER < 2.6×10^{-4}
4	4	Active Cable assembly with BER < 10^{-6}
5-190	5-BE	Reserved
191	BF	Active Loopback module
192-255	C0-FF	Vendor Specific/Custom

Note: Details for the cable assembly interface are defined using the host electrical interface codes in Table 4-5.

Table 4-10 BASE-T media interface codes

ID	Code (Hex)	Application Name	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
0	0	Undefined					
		Ethernet Applications					
1	1	1000BASE-T (Clause 40)	1.12	4	0.125	PAM5	2.236068
2	2	2.5GBASE-T (Clause 126)	2.50	4	0.200	PAM16	3.125
3	3	5GBASE-T (Clause 126)	5.00	4	0.400	PAM16	3.125
4	4	10GBASE-T (Clause 55)	10.00	4	0.800	PAM16	3.125
5	5	25GBASE-T (Clause 113)	25	4	2.000	PAM16	3.125
6	6	40GBASE-T (Clause 113)	40	4	3.200	PAM16	3.125
7	7	50GBASE-T (Placeholder)					
8-191	8-BF	Reserved					
192-255	C0-FF	Custom					

4.7   Additional Transceiver Identifier Codes

Table 4-11 Transceiver Sub-type codes

Code (hex)	QSFP+ Transceiver sub-types	QSFP-DD Transceiver sub-types	SFP-DD Transceiver sub-types	OSFP Transceiver sub-types
0	Unknown or Unspecified			
1	Type 1	Type 1	Type 1	Type 1
2	Type 2	Type 2	Type 2	Type 2
3	Type 2A	Type 2A	Reserved	Type 3
4	Type 2B	Type 2B	Reserved	Reserved
5-FF	Reserved	Reserved	Reserved	Reserved

Table 4-12 Fiber Face Type Codes

Value	Fiber face types
00h	Unknown or unspecified
01h	PC/UPC (Physical/Ultra Physical contact)
02h	APC (Angled Physical Contact)

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