

Data communications and network management engineering essay

[Engineering](#)



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DECLARATION

I certify that this report does not incorporate without acknowledgement, any material previously submitted for a degree or diploma in any university, and to the best of my knowledge and belief it does not contain any material previously published or written by another person, except where due reference is made in text. Name: K. D. K. C. Premarathna Student

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Table of Contents

1. INTRODUCTION TO TRANSMISSION MEDIA

51. 1 Why Optical fibers 51. 2 What is Fiber Optic Connectors 51. 3 Main requirements of a good connector 51. 4 Choose a Fiber Connector 61. 5 Optical fiber connectors and Splice Loss Mechanisms 71. 6 Connector Ferrule Shapes & Polishes 82. Connector Types 92. 1 The ST Connector 92. 2 The SC Connector 92. 3 FC Connector 92. 4 FDDI Connector 102. 5 ESCON Connector 102. 6 MT-RJ Connector 112. 7 LC Connector 112. 8 MU Connector 112. 9 E2000 Connector 122. 10 SC fiber optic connector basic structure 132. 11 VF-45 Connector 132. 12 Opti-Jack Connector 142. 13 MTP and MCU Connector 142. 14 Biconic Connector 152. 15 Optical Connector 153. Fiber Optic Connector types SUMMARY 164. References 17

Table of Figures

Figure 1. 5. 1: Losses Mechanism
Figure 1. 6. 1: Ferrule Shapes
Figure 2. 1. 1: ST connector
Figure 2. 1. 2: ST adapter
Figure 2. 2. 1: Simple SC connector
Figure 2. 2. 2: Duplex SC connector
Figure 2. 2. 3: Simple SC

adapter
 Figure 2. 2. 4: Duplex SC adapter
 Figure 2. 3. 1: FC connector
 Figure 2. 4. 1: FDDI connector
 Figure 2. 5. 1: ESCON connector
 Figure 2. 6. 1: MT-RJ connector
 Figure 2. 7. 1: LC connector Simplex & Duplex
 Figure 2. 7. 2: Simplex adapter
 Figure 2. 7. 3: Duplex adapter
 Figure 2. 8. 1: MU connector Simplex & adapter
 Figure 2. 9. 1: E2000 connector
 Figure 2. 10. 1: SC Connector
 Figure 2. 10. 2: SC connector Structure
 Figure 2. 11. 1: VF-45 connector
 Figure 2. 12. 1: Opti-Jack connector
 Figure 2. 13. 1: MTP-MPO connector
 Figure 2. 14. 1: Biconic connector
 Figure 2. 15. 1: Optical connector

1. INTRODUCTION TO TRANSMISSION MEDIA
 Transmission media is the propagation of a signal that carries some information from a sender to receiver. To do so it uses a medium. It will be solid, liquid, gas or plasma. Transmission media categorized to two major categories, 1. Guided Media
 2. Unguided Media (Wireless)
 Guided media is separate to , * Copper Cables*
 Fiber Optic Cables
 Fiber Optic Cables categories , Multimode Fibers
 1. Step Index
 2. Graded Index
 Single mode Fiber

1. 1 Why Optical fibers

Rapidly increase the demand for telephone communication throughout the world. The frequency limitations in the copper conductor system build a conducting medium for best quality communications with high speed necessarily. The optical fibers has low weight, greater capacity , high frequency characteristic, lower attenuation , small size, more secure. Therefore it got highly demand to long distance communication within short time period.

1.2 What is Fiber Optic Connectors

We can define a fiber joint as the points where two fibers are joined together to allow a light signal to propagate one fiber into the next continuing fiber with as little loss as possible. Reasons for fiber joints, 1. Fibers and Cables are not endless and must eventually be joined. 2. Fiber may also be joined to distribution cables and splitters. 3. Both transmit and receive termination points, fibers must be joined to equipments. 4. Due to cable cuts and their subsequent restoration. There are two main Fiber joint categories, 1. Fixed (Permanent) joint 2. Terminating (non fixed) joint For Non fixed joint, we use CONNECTERS. Connectors are made to be plugged and disconnected any number of times. There are wide variety of connector styles and types design with in the short life of fiber communications.

1.3 Main requirements of a good connector

Low coupling losses
Low cost
Ease of assembly
Low environment sensitivity
Reliable construction
Ease of connection

1.4 Choose a Fiber Connector

When selecting connector types, styles and physical characteristics have knowledge to select appropriate connector. One important criterion is connector performance when selecting a connector, comparisons of performance are generally based on, Insertion loss (Usually 0.1 to 1 dB per connection) Return loss (Back reflection) Repeatability of connection (usually specified at thousands of times) 1.5 Optical fiber connectors and Splice Loss Mechanisms. Loss is minimized when the two fiber cores are perfectly and identically aligned. The ways of losses, Insertion loss and return loss is

caused due to End gap of the optic. Air gap between the fibers cause a reflection. This is called as back reflection or optical return loss. Various types of polishing techniques are used to minimize this losses. fiber optic cableA rough space can scatter light and dirt can absorb light. Due to this small airborne dirt can be major source of loss. Therefore connectors should have to protect light beam by covering. Light from a fiber in larger NA (Numerical Aperture) will be more sensitive to angularity. Therefore Larger NA to Smaller NA transmission will loss the light beam. The fiber mismatch can occur due to connecting two dissimilar fibers and production variance fibers.

Figure1. 5. 1

1. 6 Connector Ferrule Shapes & Polishes

Fiber optic connectors can have several types of different ferrule shapes. PC (Physical Contact) connectors has typical losses of 0. 3dB. Also have return loss of 30 to 40dB. The convex ferrules are more good for the fiber cores. Losses under 0. 3dB and return 40dB or better. The final solution for single mode systems extremely sensitive to reflections and it take angle of the end of the ferrule is 8 degrees to create APC (Angled Physical Contact).

fiber optic Connectors

Figure1. 6. 1

2. Connector Types

2. 1 The ST- style Connector

This type referred as the " BIFOC" connector and it is simple fiber connector which means fiber in one ferrule with one 2. 5mm cylindrical ferrule. It is a <https://assignbuster.com/data-communications-and-network-management-engineering-essay/>

bayonet style connector similar to coaxial BNC connector and is available for single mode and multi mode applications. Four connectors and two adapters are required to get a duplex ST-style connection. The housing of the ST includes a push and twist. Spring loaded latching mechanism is use most standards of connector types. This one of high performance, robust optical fiber connector in tele communication market. http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image012_0000.jpghttp://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image010_0000.jpgFigure 2. 1. 1: SC connectorFigure 2. 1. 2 : SC Adapter

2. 2 The SC Duplex Connector

Some properties of ST connectors are not well suited for LAN market.

Therefore SC Duplex was introduced. The housing mechanism is push pull latch , it make easier to mate and de-mate and reduce finger space needed.

Sometimes referred as the TIA568A connector , consists of two SC connectors yoked together that both can mate and de-mate with the same push and pull. These features help to become recommended connector in LAN standards in both North America(in EIA/TIA-568-A) and internationally(in ISO 11801). http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image015_0000.jpghttp://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image017_0000.jpghttp://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image019_0000.jpghttp://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image021.pngFigure 2. 2. 1: Simple SC Figure 2. 2. 2: Figure 2. 2. 3: Figure 2. 2. 4: connectorDuplex Simple SC adapter Duplex SC adapter

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http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image017_0000.jpg

http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image019_0000.jpg

http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image021.png

Figure 2. 2. 1: Simple SC

Figure 2. 2. 2: Figure 2. 2. 3: Figure 2. 2. 4: connectorDuplex Simple

SC adapter Duplex SC adapter

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ST-style and SC Duplex Connector Comparison Chart

ST-Style SC Duplex

ST-style SC Duplex

Ferrule 2.5mm Cylindrical 2.5mm Cylindrical Ferrule Type Simplex

Simplex Duplex connector? No Yes, with Yoke Latching Type Push and Twist

Push-pull

2.3 FC Connectors

Screw on mechanism and available in single mode and multimode. It has 2.5mm ferrule. Usually design for telecommunication applications and provide disconnect performances. Design with a threaded coupling for durable connections. http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image014_0000.jpg

Figure 2.3.1: FC connector

2.4 FDDI Connectors

FDDI connector's also has 2.5mm ferrules. this type is Duplex and multimode. Generally use to connect to the wall outlet. http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image023.png

Figure 2.4.1: FDDI Connector

2.5 ESCON Connector

ESCON connectors similar to FDDI connectors. It contain a retractable shroud instead of a fixed shroud and also has robust strain relief design. Figure 2.5.1: ESCON connectors http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image025_0000.jpg

Small Form Factor Connectors

Although SC Duplex Connector solve some of the LAN related issues for fiber connectivity, it unable to solve problem with density because of the single fiber ferrules, the large housing and the finger space. The fiber connection density was twice of traditional copper terminators(RJ-45). Industry needed duplex fiber connector that had the same basic size as RJ-45 copper connector - a small form factor connector. Now there are two types of famous connector types.

2. 6 MT-RJ Connector

This designed with a single, two fiber ferrule. MT ferrule has a rectangular cross section with two fiber spaced 700?? m apart and two guide pin holes. Due to this it take small form factor connector with the highest fiber density. The housing around the MT-RJ can fit in the same port space as an RJ-45.

Figure 2. 6. 1: MT-RJ Connector http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image043.png

2. 7 LC Connector LC connector was develop using a reduced diameter , simplex fiber ferrule . Instead of the 2. 5mm ferrule , the LC connector use 1. 25mm cylindrical ferrule. Smaller ferrule allows a small housing. The LC connectors also feature a latching mechanism similar to RJ-45. http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image031_0000.jpg

http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image029_0000.jpg

Figure 2. 7. 1: Figure 2. 7.

2: Figure 2. 7. 3: LC Connector Simplex & Duplex Simplex Adapter Duplex

Adapter MT-RJ and LC Duplex Connector Comparison Chart MT-RJ LC

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MT-RJ LCMTMMM

Ferrule 2. 5mm x 4. 5mm Rectangular 1. 25mm Cylindrical Ferrule Type Duplex Simplex Duplex Connector? Yes Yes, with Yoke Latching Type RJ Latch RJ Latch Single Ferrule YES NO Smallest Size (Duplex) YES NO Plug and Jack Model? YES NO GbE Compliant? YES YES 2. 8 MU Connectors http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image033_0000.jpg MU connectors are also in simplex and duplex modes. It has 1. 25mm ferrule and has pull and push mechanism. Application include high speed communications, voice networks, telecommunications , dense wavelength division multiplexing and multiple optical connections. Figure 2. 8. 1: MU connectors simplex & Duplex

2. 9 E2000 Connector

Externally this connector is looks like miniature SC connector and has 1. 25mm ferrule with a push - pull latching mechanism which clicks when fully inserted. Available in single and multi mode. Also called as LX. 5 Connector. Spring loaded shutter protects the ferrule from dust and scratches. It close automatically when the connector is disengaged and lock in potentially harm full laser beams. http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image039_0000.jpg Figure 2. 9. 1: E2000 Connectors

2. 10 SC fiber optic connector basic structure

Figure 2. 7. 1: SC connector sample http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image004_0002.jpg http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image002_0001.jpg Figure 2.

10. 2: SC connector structure Elements in SC connector

1. The fiber ferrule. SC connector is build around a long cylinder 2. 5mm diameter ferrule. It has precision hole drilled in the center of the ferrule. End of the fiber is has polished smoothly.
2. The connector sub assembly body. This is mechanism to hold the cable in fiber in place. The end of the ferrule protrudes out of the sub assembly body to combine with another SC connector called adapter or coupler.
3. The connector housing Then it assembled together with the connector housing. Connector housing mechanism use for snapping in to a combining adapter and hold the connector.
4. The fiber cable. Without putting stress on the fiber this provides the strength for mechanical handing of the connector.
5. The stress relief body This cover the joints between body and fiber cable protects fiber cable from physical damages.

2. 11 VF-45 Connector http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image049.jpg VF-45 has plug and jack design without of adapters. Plug is inserted into the socket at a 45 degree angles, pressing a pair of fiber into the socket. Figure 2. 11. 1: VF-45 Connector

2. 12 Opti-Jack Connectors

This is version of Fiber Jack connector design. It gives a snap-lock plug and socket for a pair of fiber cables. The way of plugging and removing is same as RJ-45 connectors. It has two ST type 2. 5mm ferrules. This duplex fiber optic standardized by the TIA , communication Industry Association.

http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image051.jpg Figure 2. 12. 1: Opti-Jack Connector

2. 13 MTP and MPO Connector

This are compatible ribbon fiber connectors. It has MT ferrule that allows to quick and reliable connections. Up to 12 fibers in a ribbon are stripped to 125um cladding and inserted into 250um spaced parallel grooves. The ferrule has two 0. 7mm diameter holes. They are in parallel to the fibers. This has male female connector design. These connectors are trying to align lot of fibers. Coupling losses are typically bigger than single fiber connectors.

[http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image053.](http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image053.jpg)

jpgFigure 2. 13. 1: MTP-MPO Connector.

2. 14Biconic Connector

This has a cone shaped ferrule , it helps to align the optical fiber at the connection interface. This is use for military fiber optic applications. The ferrule can be made with polymer or metal. Applications include LAN and premises networks, cable television, remote sensing data processing and medical instrumentation. [http://www.fiberoptics4sale.](http://www.fiberoptics4sale.com/Merchant2/fofs_img/clip_image061.jpg)

com/Merchant2/fofs_img/clip_image061. jpgFigure 2. 14. 1: Biconic

Connector

2. 15 Optical Connectors.

This is a pre- assembled one piece connector. And also it called as connector kit. This type of connectors can enable quicker connection and disconnection. This consists with ferrule , connector body, coupling device and cable. Features of optical connectors are Low insertion loss and back reflection loss, Free floating ceramic ferrule, UL rated plastic housing and boot and High precision alignmentd4 cableFigure 2. 15. 1: Optical connectors

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3. Fiber Optic Connector types SUMMARY

Optical connectors Long form Coupling type Ferrule

diameter Standard Applications FC connector Screw 2.5mm IEC 61754-13 Datacom., telecom, measurement equipment, single-mode lasers, becoming less common ST connector Bayonet Bayonet 2.5mm IEC 61754-2 Multimode, rarely single-mode, APC not possible ESCON connector Enterprise Systems Connection Snap (duplex) 2.5mm IBM mainframe computers and peripherals SC connector Subscriber Connector Snap (push-pull coupling) 2.5mm IEC 61754-4 Datacom. and telecom; extremely common LCLucent Snap 1.25mm IEC 61754-20 High-density connections, SFP transceivers, XFP transceivers MT-RJ connector Snap (duplex) 2.45mm IEC 61754-18 Duplex multimode connections MU connector Miniature unit Snap 1.25mm IEC 61754-6 Common in Japan E-2000 connector Snap, with light and dust-cap 2.5mm IEC 61754-15 Telecom, DWDM systems; D4 connector Screw 2.0mm Telecom in the 1970s and 1980s, obsolete SMA 905 connector Sub Miniature A Screw typ. 3.14mm Industrial lasers, military; telecom multimode SMA 906 connector Sub Miniature A Screw Industrial lasers, military; telecom multimode ADT-UNI connector Screw 2.5mm Measurement equipment Avio connector Screw Aerospace and avionics F-3000 Snap, with light and dust-cap 1.25mm IEC 61754-20 Fiber To The Home (LC Compatible)