

Certified Fiber Optics Technician (FOT) Competency Requirements - ETA[®] International



1.0 PRINCIPLES OF FIBER OPTIC TRANSMISSION

- 1.1 Describe the basic parts of a fiber optic link
- 1.2 Describe the basic operation of a transmitter
- 1.3 Describe the basic operation of a receiver
- 1.4 Explain Amplitude Modulation
- 1.5 Compare Digital data transmission with analog
- 1.6 Graphically explain how Analog to Digital Conversion (A/D) is accomplished
- 1.7 Graphically explain how Digital to Analog Conversion (D/A) circuitry works
- 1.8 Explain the difference between Pulse Coded Modulation and Amplitude modulation
- 1.9 List the benefits of Multiplexing signals
- 1.10 Explain the purpose of Decibels (dBs) and convert voltage and power levels to and from decibel equivalents
- 1.11 Explain how Optical Power is measured (dBm), express optical power levels in dbm and compare power gains and losses

2.0 BASIC PRINCIPLES OF LIGHT

- 2.1 Describe the Electromagnetic Spectrum and locate light frequencies within the spectrum in relation to communications frequencies
- 2.2 Convert various wavelengths to corresponding frequencies
- 2.3 Explain the theories of light particles and light waves
- 2.4 Describe how the Index of Refraction is calculated
- 2.5 Define Fresnel Reflection Loss
- 2.6 Explain the effects of Refraction and Snell's Law
- 2.7 Calculate the Index of Refraction in two different mediums

3.0 OPTICAL FIBER CONSTRUCTION AND THEORY

- 3.1 Name the materials out of which fiber optic cable core is manufactured
- 3.2 Describe the purpose of Cladding and how it is applied to the core of fiber optics cables
- 3.3 Name the materials from which the FO Coating is manufactured
- 3.4 Explain why Multimode fiber optics cable may be selected over singlemode
- 3.5 Describe Singlemode fiber optics cable and how it differs from multimode
- 3.6 List common classifications for fiber optics cable
- 3.7 Describe Refractive Index Profiles and their purpose
- 3.8 Describe the basics of Optical Fiber manufacturing

4.0 OPTICAL FIBER CHARACTERISTICS

- 4.1 Explain Modal Dispersion and its importance to fiber optics
- 4.2 Define Material Dispersion
- 4.3 List Bandwidth limitations for common communications cable types
- 4.4 Measure the Attenuation Loss in fiber optics cables
- 4.5 Demonstrate the effects of Microbending fiber cables
- 4.6 Define Macrobend and explain its importance in fiber cabling

- 4.7 Explain how the Numerical Aperture is arrived at in fiber connectors
- 4.8 Identify the 'Cone of Acceptance' as used in fiber cabling
- 4.9 Compare the Tensile Strength of fiber and other communications cables
- 4.10 Explain how to calculate Bend Radius limitations

5.0 ADVANTAGES OF FIBER OVER COPPER

- 5.1 List Bandwidth Limitations of various copper cables and fiber cables
- 5.2 Describe Attenuation in copper and fiber cables
- 5.3 Explain why Electromagnetic Immunity is superior in fiber cabling
- 5.4 List Weight differences for telephone, coaxial and fiber cables
- 5.5 Make a comparison between the size of fiber cable vs: copper types
- 5.6 Explain why fiber cables present less risks of Safety concerns than copper cabling
- 5.7 Compare Security features of fiber cabling vs. electromagnetic cables

6.0 FIBER OPTIC CABLES

- 6.1 Draw a cross-section of a Fiber Optic Cable and explain the purposes of each segment
- 6.2 Explain why and where Loose Tube Cable is used
- 6.3 Describe Tight Buffered Fiber
- 6.4 Identify the Strength Member in a fiber cable
- 6.5 Specify the Cable Jacket Material used in common types of fiber cables
- 6.6 Define Duty Specification
- 6.7 Explain the differences between Simplex Cordage and duplex cordage
- 6.8 List locations where Duplex Cordage is preferred over Simplex
- 6.9 Define Distribution cable
- 6.10 Explain how and where Breakout cable is used
- 6.11 List reasons for utilizing Armored fiber cables
- 6.12 Explain what a Messenger cable is and how it is used
- 6.13 Describe Ribbon Cable
- 6.14 Explain what Hybrid cables are and where they are ordinarily used
- 6.15 Define Composite signals
- 6.16 Explain where the TIA/EIA-598 Color Code is used and how the colors are used to identify individual cables
- 6.17 Describe Cable Markings and how they are used
- 6.18 Define Tensile Strength of a fiber cable and explain the reasons an installer would need to know the strength of various cables
- 6.19 Describe the Dynamic Load of a fiber cable
- 6.20 Define Static Load as it refers to fiber cabling
- 6.21 Demonstrate the detrimental effects of exceeding minimum the Dynamic Bend Radius of a fiber cable
- 6.22 Define Static Bend Radius

7.0 SOURCES

- 7.1 Explain the Safety Classifications for light sources used in fiber communications
- 7.2 Describe the effects of Laser exposure to the human body
- 7.3 Explain the differences between Light-emitting Diodes and laser optics

- 7.4 List the common Wavelengths used in fiber communications and the advantages and disadvantages of each
- 7.5 Measure the Output Power of a light generator
- 7.6 Define Spectral Width of the output of a light generator
- 7.7 Compare the Speed of Operation of one light source vs: another
- 7.8 Compare Ease of Operation of the types of light sources commonly used in fiber signal generation
- 7.9 Present historical data and future estimates for the Lifetime of fiber cables and fiber light generators
- 7.10 Compare the Source Characteristics of LEDs and Lasers

8.0 DETECTORS

- 8.1 Describe the optical and electrical theory of operation of Photodiode
- 8.2 Compare Common Detector designs
- 8.3 Explain the use for PIN Photodiodes and theory of operation
- 8.4 Describe the action of an Avalanche Photodiode (APD)
- 8.5 Locate the Performance Characteristic – Responsivity specifications for various optical detectors
- 8.6 Explain Bit Error Rate (BER) and how it is utilized in fiber optics communications equipment

9.0 CONNECTORS

- 9.1 Identify TIA/EIA 568-A Standard Connector Types
- 9.2 List Connector Requirements for various types
- 9.3 Describe Ferrule Materials used with fiber optics connectors
- 9.4 Explain Intrinsic Factors applicable to fiber connectors
- 9.5 Explain Extrinsic Factors
- 9.6 Measure Interconnection Losses using common measuring equipment
- 9.7 Measure Return Reflections in a completed cable
- 9.8 Define PC Finish
- 9.9 Explain APC Finish
- 9.10 Describe how and where Pigtails are used in fiber cabling
- 9.11 Demonstrate the proper use of Anaerobic Epoxy
- 9.12 Explain how and where UV Epoxy is used
- 9.13 Demonstrate the use of 2-Part Epoxy
- 9.14 Describe Pre-Load Epoxy
- 9.15 Explain why and where Epoxyless Connectors are best used
- 9.16 Demonstrate proper Fiber Preparation techniques
- 9.17 Properly assemble and connect common types of connectors
- 9.18 List steps taken to properly perform a Visual Inspection of a cable
- 9.19 List ways to properly care for Fiber Optic Connectors
- 9.20 Explain and demonstrate TIA/EIA 568-A Performance Testing

10.0 PASSIVE COMPONENTS

- 10.1 Explain the uses and benefits as well as disadvantages of using fiber optics cable couplers

- 10.2 Describe where a Tee Coupler is used
- 10.3 Describe where a Star Coupler is used
- 10.4 Explain the operation of a Reflective Star Coupler
- 10.5 Define Transmissive Star Coupler
- 10.6 Explain modulation and how Wavelength Division Multiplexing (WDM) is used in fiber cable signal distribution systems
- 10.7 Explain the difference between Dense Wavelength Division Multiplexing (DWDM) and Course Wavelength Division Multiplexing (CWDM)

11.0 TYPES OF SPLICING

- 11.1 Mechanical Splicing:
 - 11.1.1 Explain the differences between Intrinsic Factors and extrinsic factors when splicing fiber cables
 - 11.1.2 List Extrinsic Factors important in fiber splicing
 - 11.1.3 Demonstrate correct Fiber Preparation
 - 11.1.4 Define Index Matching Gel
 - 11.1.5 Explain Performance Characteristics of different gel compositions
 - 11.1.6 Perform TIA/EIA 568-A Performance Testing procedures
- 11.2 Fusion Splicing:
 - 11.2.1 List Fusion Splice Requirements
 - 11.2.2 Demonstrate proper Fiber Preparation
 - 11.2.3 Explain the use of the Splice Closure
 - 11.2.4 Perform TIA/EIA 568-A Performance Testing of the fusion splice

12.0 CABLE INSTALLATION AND HARDWARE

- 12.1 Explain Dynamic Tensile Loading
- 12.2 Explain Static Tensile Loading
- 12.3 Compare the Dynamic Bend Radius minimums for common fiber cables
- 12.4 Describe the effects of exceeding Static Bend Radius minimums
- 12.5 Demonstrate proper use of Pulling Tape
- 12.6 Define Pulling Grip
- 12.7 Explain where Conduit should be installed to enclose fiber cables
- 12.8 Describe the requirements for Tray and Duct Installation of fiber cabling
- 12.9 Explain the National Electric Code (Article 770) rules

13.0 FIBER OPTIC LINK

- 13.1 List the consideration for Basic fiber optics System Design
- 13.2 Prepare a Basic Optical Link Power Budget
- 13.3 Calculate a Basic Optical Link Power Budget

14.0 OPTICAL FIBER MEASUREMENT AND TESTING

- 14.1 Explain fiber optics cable Measurement Standards
- 14.2 Demonstrate the proper use of Optical Loss Test Sets
- 14.3 List common Fiber Optic Sources (FOS)
- 14.4 Demonstrate proper and safe use of the Fiber Optic Light Meter (FOM)

- 14.5 Locate a fault using an Optical Time Domain Reflectometer (OTDR) and point out the aberrations in the display presentation and describe their likely causes
- 14.6 Describe the Fiber Identifier

15.0 LINK AND CABLE TESTING

- 15.1 Perform Fiber Optic Source (FOS) and Fiber Optic Meter (FOM) Link Testing
- 15.2 Perform Fiber Optic Source (FOS) and Fiber Optic Meter (FOM) Patch Cable Testing
- 15.3 Perform Optical Time Domain Reflectometer (OTDR) Unit Length Testing
- 15.4 Perform Optical Time Domain Reflectometer (OTDR) Connector and Splice Evaluation
- 15.5 Perform Optical Time Domain Reflectometer (OTDR) Fault Location
- 15.6 Prepare Acceptance Testing Documentation

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