The Fiber Optic Association, Inc.

1-760-451-3655 Fax 1-781-207-2421
Email: info@thefoa.org http://www.TheFOA.org

Fiber Optic Installers
Checklist for Tools, Test Equipment & Supplies

Before buying your equipment – questions to consider:

- ✓ What is your budget?
- ✓ What kinds of applications are you going to do – premises or outside plant – or both? That will dictate the types of tools and test equipment you need.
- ✓ What types of components - fiber, cable and connectors - will you be working with? Some cable and connector types (like ADSS cable and prepolished connectors) require special manufacturer-specific kits. They types of connectors you do will also dictate the types of supplies like adhesives and polishing films.

LIST OF TEST EQUIIPMENT, TOOLS AND CONSUMABLES:

Quantity	Tool or Test Equipment	Comments
	Tools For Installer's Toolbox	
1	Tubing Cutter – cuts through armored cable	A regular plumber's tubing cutter is perfect for cutting the cable jacket and armor
1	Rotary Cable Slitting & Ringing Tool	To cut cable jacket for removal – to cut around cable or slit jacket for removal
1	Cable Jacket Stripper	Used for cutting 2-3mm cable jacket for removal
1	Fiber Optic Stripper	Used to remove primary coating from fiber without nicking the optic fiber. Some are also capable of cutting 2-3mm cable jacket
1	Buffer Tube Stripper – to cut jacket/buffer tubes in loose tube cable	Similar to some coax or UTP jacket cutters but must be precise to prevent fiber damage
1	Crimp Tool – crimps FO connector on the cable	Must have crimp die appropriate for the crimp size required by the connector

		being used for termination
1	Kevlar Scissors – super-sharp to cut Kevlar fibers in fo cable	NEVER use these scissors to cut anything else – they are expensive and will dull easily if used to cut other materials
1	Scribe – used to cleave fiber when terminating	Sapphire or carbide are best
1	Needle Nose Pliers – use when accessing and pulling cords or ripcords.	
1	Tweezers	
1	Polishing Plate – place under polishing pad	Need smooth surface for polishing
1	Polishing Pad – place under polishing film	Provides soft polishing surface for PC connectors
1	Polishing Puck – insert connector into this polishing tool, lay on polishing paper	Need one for 2.5mm ferrule connectors (ST/SC/FC) and one for 1.25mm ferrule connectors (LC)
1	Safety Glasses	ALWAYS wear safety glasses
Optional	Connector Curing Oven – to cure epoxy/polish connectors	Epoxy/polish connectors are still the cheapest and most reliable and a portable curing oven allows fast installation
1	Lineman Scissors – heavy duty to cut through cables or other heavy materials	Use these for general cutting – NOT your kevlar scissors which are expensive and dull easily
	Test & Installation Equipment	
1	Flashlight Continuity Tester (MM only) or Visual Fault Locator (VFL – red laser – SM or MM) – bright, visible light source for checking continuity or tracing fibers, VFL can find faults also	Continuity tester as a minimum, VFL recommended – the hogher power makes it more versatile
1	Light source	850/1300nm LED for MM, 1310 and/or 1550 for SM
1	Power meter	Calibrated at 850/1300/1550 nm
As needed	Power meter adapters	One adapter can fit 2.5mm ferrules (ST/SC/FC) on some meters or may require dedicated adapters
2 per test kit	Reference Test Cables - tested and known	Need 2 each (launch and

	to be low loss	receive) that match the fiber type (62.5/125, 50/125 or SM) and connector types. If meter has universal 2.5mm adapter, you may be able to test all 3 types (ST/SC/FC) using one type with hybrid mating adapters, these wear out and need frequent replacement. Test and replace as needed
2 per test kit	Connector Mating Adapters – with metal or ceramic alignment sleeves (NOT PLASTIC)	ST/ST, SC/SC, etc. or hybrid ST/SC, etc. Note that just like reference cables, these wear out and need frequent replacement
1	Connector inspection microscope	100-400X microscope with adapters for fiber optic connectors. Should have oblique lighting for best viewing of connector ferrule surface and e IR filter to protect eyes from fiber optic source light in fibers
Optional	ST Bare fiber adapter – to test bare fibers	This is a connector with a clamp on the back that allows cleaving the fiber and using for tests.
Optional	Optical Time Domain Reflectometer (OTDR) or the FOA has a “OTDR simulator” that runs on Windows. The software will run without the hardware but all the functions of trace analysis are available. Can be downloaded – no charge: http://www.thefoa.org/tech/ref/testing/OTDR/OTDRsimulator.html	Used for OSP cables to verify splices and troubleshoot problems. Special OTDRs can also be used in premises if cables are sufficiently long.
	Cleaning/Safety Materials	
1	Safety Glasses	ALWAYS wear safety glasses
Many	Alcohol-saturated pads – to clean fiber and connectors during splice, termination, test, CleanTex 806 or equivalent (may also use	MUST be pure alcohol since rubbing types have high water content that will cause

	lab wipes and reagent grade ethanol)	problems with adhesives and fibers
Many	Lab wipes – e.g. Kimwipes	Use to clean up, dry off connectors after cleaning with alcohol pads
1 per job	Trash bin – small disposible container with top to hold fiber scraps	1 pint deli container with lid works well
1 per student	Black work mat	Helps see the fiber scraps to clean up – black place mats or vinyl cut to size
1	Dry connector cleaner	These have opening to push connector in, operate once to clean connector. Neater than wet cleaning, just as effective
	Termination Consumable Kit:	
Optional	Connector Curing Oven – to cure epoxy/polish connectors	Epoxy/polish connectors are still the cheapest and most reliable and a portable curing oven allows fast installation
Several	Heat Cure, 2-Part Epoxy, 2.5 Gram	"BiPax" Package has epoxy and hardener in plastic package that is mixed in the package. Can be used with many connectors at one time
Several	Cheap scissors to cut corner off epoxy package	You will get epoxy on these when you cut the epoxy package so get cheap ones and discard after use
1	3cc Application Syringe w/flat end needle to apply epoxy.	
1 bottle	Anaerobic Adhesive + Accelerator (optional) (Loctite 648 adhesive, 10ml bottle, Loctite 7649 accellerator works well)	See recommended directions on FOA site (Anaerobic connector termination)
1 for each type of connector	Polishing puck	Usually come in versions for 2.5mm ferrule or 1.25mm ferrule. May be plastic or metal.
Sheets as needed	12 µm Aluminum Oxide Lapping Film, 3x6" Sheet with 3mil Backing.	Use for "air polishing" fiber – first polishing step. Purchase polishing film in packages typically of 100 sheets.
Sheets as needed	3 µm Aluminum Oxide Lapping Film, 3x6" Sheet with 3mil Backing	Place on pad on top of polishing plate for first flat

		polish with polishing puck
Sheets as needed	1µm Aluminum Oxide Lapping Film, 3x6" Sheet with 3mil Backing	Place on pad on top of polishing plate for final polish with polishing puck
1	Fusion Splicer For SOCs (Splice-on connectors) EasySplicer is a Fusion Splicer used by many FOA schools.	It is essential for outside plant and because of the rising importance of fusion splice on connectors, is highly recommended for termination labs.
	Splicing Kit	
1	Fusion splicer	Many types and manufacturers are available
1	Fusion Splicer EasySplicer is a Fusion Splicer used by many FOA schools.	It is essential for outside plant and because of the rising importance of fusion splice on connectors, is highly recommended for termination labs.
1	Fiber cleaver	Most fusion splicers come with a quality cleaver. The same cleaver should be used with mechanical splices
As needed	Fusion splice protectors	Use the type recommended by the fusion splicer manufacturer
As needed	Mechanical splices	Many types exist, mostly used for restoration
1	Mechanical splice tool(s)	Some mechanical splices require special tools to crimp the splice or fibers
As needed	Wipes and reagent-grade (99%+ pure) alcohol (ethanol)	Use for cleaning fibers before splicing
	Reference Materials	
As needed	Instruction sheets and manuals, websites, videos, etc. for all equipment and processes	Don’t forget all the FOA Guide, YouTube and Fiber U free information available on your smartphone or tablet: www.thefoa.org

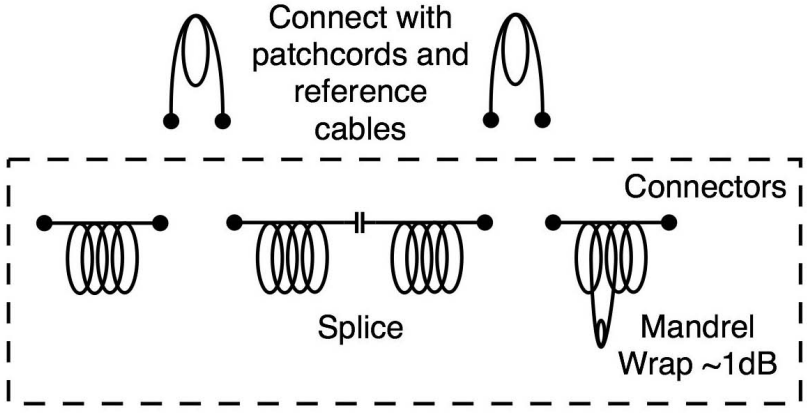
Information provided by the FOA is intended to be a guide to assist you in making decisions as to what kinds of equipment you need. It's not complete – you need to use it only as guidelines to develop your own equipment and materials lists. FOA assumes no liability for this list's use or your work.

Lab Set-up:
Standard Lab Set-up – Every work station has a tool box with test equipment (microscope, VFL, light source and power meter) and tools. The work station is set up for a pair of students with a max of 16 students (8 work stations).

Limited budget option – Every work station has a set of tools with one or two text kits to share among the students. Use the FOA OTDR Simulator, Invite OTDR and Fusion Splicer manufacturers to come in to give a demo. Get samples from connector manufacturers also

If you have additional budget $ – purchase OTDR and Fusion Splicer (see list of suppliers)

Simulated Cable Plant For Labs
The labs for this course should use a simulated cable plant similar to this diagram. Having a simulated cable plant that is well characterized for both insertion loss and OTDR tests allows the instructor to quickly evaluate the students' testing. For the course, both singlemode and multimode simulated cable plants are recommended if appropriate test equipment is available.



Lengths: MM: 5-20m	MM: 100 to 500 ea.	MM: 20 to100m
SM: 10 - 50m	SM: 0.5 to 5 km ea.	SM: 50 to 500m

Additional Tips:
The instructor needs an additional set of tools for demonstration purposes and should be in charge of the test equipment. The instructor should also have additional consumables to cover student usage.

During the first few terminations the instructor should mix and distribute the adhesive. One package of epoxy, for example, is adequate for an entire class.

Consider using the OTDR simulator for training:

The OTDR Simulator is a aid to learning how OTDRs work without incurring the expense of owning a real OTDR and tons of cable. The Simulator runs on a PC (Windows 7 or XP versions are available) but works just like a real OTDR. It is the actual operating software from a PC-based OTDR that comes with numerous traces that illustrate how the OTDR works and traces of real cable plants to analyze. The traces are raw data that is analyzed in the PC so the simulator works just like a real OTDR.

If you don't have a PC running Windows 7 or XP, we have a source of cheap used netbooks that can be used for the simulator and project for the class.

There is also a Tutorial on how to use the OTDR Simulator

Link to the software:

http://www.thefoa.org/tech/ref/testing/OTDR/OTDRsimulator.html

Sources of Fiber Optic Tools and Supplies
Many of these tools are available from cabling or electrical distributors. *Be wary of buying from discount fiber optic distributors as they sometimes sell imported counterfeit tools that do not work properly.*

***Fiber optic test equipment: meters, sources, visual fault locator, OTDR, complete toolboxes, microscope:**

Advanced Fiber Solutions
E-Mail: info@advancedfibersolutions.com, http://www.afsi.us
Ask for your FOA instructor discount

Fusion Splicer*:* EasySplicer http://www.easysplicer-usa.co.

Full line fiber optic distributor:
The Fiber Optic Center:

www.FOCenter.com 508-992-6464, sales@focenter.com

Connectors and connector related products: **PT Fiberoptics Inc**. E-Mail*:* perspective@vcnet.com 760-671-6606

http://users.vcnet.com/perspective/

Splice Enclosure: Preformed Line Products, http://www.preformed.com