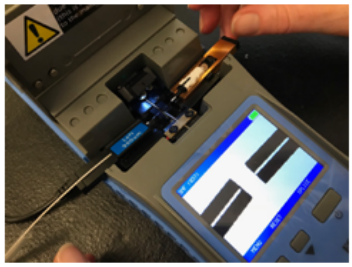
FOA Reference Guide For Fiber Optics



Virtual Hands-On - Prepolished/Splice & Fusion Splice-On Connector Termination

This FOA virtual hands-on (VHO) tutorial on fiber optics covers fiber optic cable termination using a prepolished/splice and fusion splice-on connector process. It is copyrighted by the FOA and may not be distributed without FOA permission.

This VHO covers similar material to the videos on YouTube.

Safety Rules

- Read and follow rules in lab manual
- Wear safety glasses
- Dispose of fiber scraps carefully
- Careful with chemicals
- No eating or drinking

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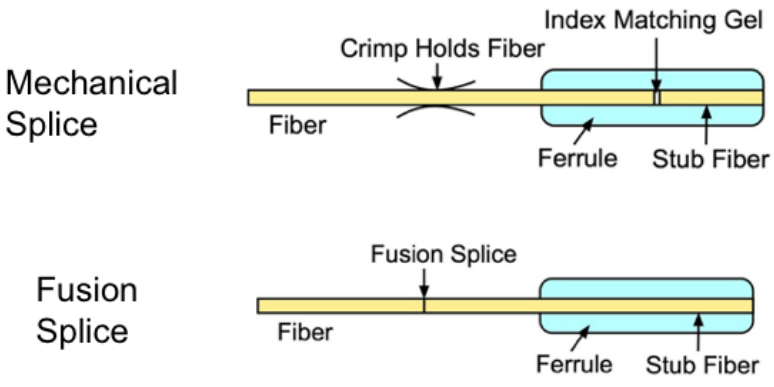
The lab manual has several pages of rules for safety in fiber optic labs. Each student should be familiar with them and follow them carefully. Instructors must follow them too!

Connector Termination - Prepolished Splice



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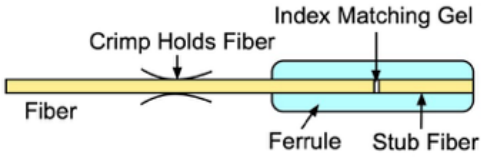
Most manufacturers now offer connectors that have a short stub fiber already epoxied into the ferrule and polished perfectly, so you just cleave a fiber and terminate the connector with a splice.

Some of these connector attach the fiber with a mechanical splice. The inserted fiber is crimped or clamped with a special tool to hold it in place. Others use a fusion splicer to attach the connector using a regular fusion splice.

This presentation will show both types of these terminations for comparison.

Also see the videos on YouTube about Corning and Panduit prepolished/splice connectors and Splice-On Connectors using an EasySplicer.

Prepolished Mechanical Splice Connector



Connectors with mechanical splices have been available since the 1990s, offering faster termination speeds than adhesive/polish connectors.

While this technique makes termination faster, it has several downsides.

First it is more costly, several times as much as an epoxy/ polish type.

Second, you have to make a good cleave to make them low loss, and that is not easy, especially with the cheap cleaver provided in some termination kits.

Third, even if you do everything correctly, you loss will be higher, because you have a connector loss and a splice losses at every connection.

These connectors may be good for quick termination or restorationbut are probably not the lowest loss, lowest cost most reliable solution – that's epoxy polish or the new fusion splice-on connectors (SOCs).

Also see the videos on YouTube about Corning and Panduit prepolished/splice connectors.

Termination Process- Prepolished Splice

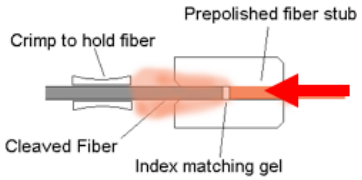
- Strip cable
- Strip and clean fiber
- Cleave fiber
- Insert fiber into connector body
- Active align with VFL if possible
- Crimp or fix in place
- Complete connector assembly

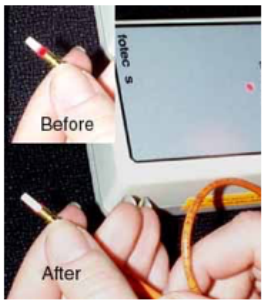
The process for terminating a prepolished mechanical splice connector is dependent on following the manufacturer's process exactly. Strip and cleave lengths are critical to getting low loss, strong connectors. The fiber must butt up against the fiber stub in the connector with some pressure to have a low loss splice. The fiber buffer must be stripped to the correct length to allow proper grip in the crimp of the connector. Cable jackets and strength members (aramid fibers) are also important as they are crimped to the connector to provide pull out strength. Under any circumstances, the pull strength of these connectors is lower than adhesive connectors and they should be handled carefully.

Cleave must be good or splice inside connector will be bad. It is not possible to over-emphasize the importance of a good cleave! No splice can be low loss unless both fibers are properly cleaved. The fiber stub has been properly cleaved and index matching gel injected in the connector ready for the field-cleaved splice, but a bad cleave on the fiber inserted into the connector will cause high loss. The stapler-type cleaver provided with most manufacturer's termination kits requires practice and skill to work properly. Several manufacturers offer a premium kit with a high-quality clever like used with fusion splicing which will provide better and more consistent results. The installer has two choices: practice with the inexpensive cleaver or purchase an expensive cleaver - which will probably pay itself back in the first big job.

Using Visual Fault Locator

- Using a VFL allows seeing where loss is happening and minimizing it
- Shooting from connector end, will see glow in backshell of connector
- From fiber end, will see glow in ferrule
- Minimize glow = best splice in connector





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Prepolished connectors require a good cleave on the fiber to get proper termination and you must fully insert the fiber in the connector to make a good splice. Using a visible fault locator (a bright red laser coupled into the fiber) allows you to see the “loss” in the mechanical splice in the connector and work the fiber position to get a good termination.

Shooting from connector end, will see glow in backshell of connector, shooting from the fiber end, the glow will be in the ferrule (bottom photos.)

Minimize glow = best splice in connector

Termination Process- Prepolished Splice

- Corning Unicam Pretium Kit
- Precision cleaver
- Connector tool with built-in VFL checker

For this VHO presentation we will use the Corning Pretium kit. This kit includes a precision cleaver and termination tool that automate much of the connector termination process.

Termination Process- Prepolished Splice

- Place connector in termination tool

Begin by placing a connector in the termination tool. You need to follow directions to ensure it is properly placed in the tool and the test VFL is connected.

Termination Process- Prepolished Splice

- Mark and stripthe fiber to the appropriate length and clean it

Follow the directions with the kit to mark and strip the fiber to the correct lengths.

Note: parts of the connector assembly including the splice protector, backshell of the connector and strain relief must be slid on the mating fiber in correct order before it is prepared for splicing.

Termination Process- Prepolished Splice

- Insert fiber in connector already in termination tool

Insert the cleaved fiber in the connector held in the termination tool.

Termination Process- Prepolished Splice

- The green light means the connector has been tested with the VFL and is good

The tool indicates when the fiber is properly inserted in the tool with a green light.

Termination Process- Prepolished Splice

- Crimp by turning lever on tool

Turn the lever to crimp or "cam" the connector.

Termination Process- Prepolished Splice

- Place stripped fiber in cleaving tool and cleave

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Insert the fiber in the cleaver and operate it to cleave the fiber. Remove and properly dispose of the fiber scrap.

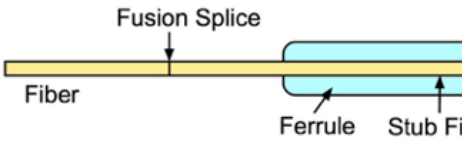
Termination Process- Prepolished Splice

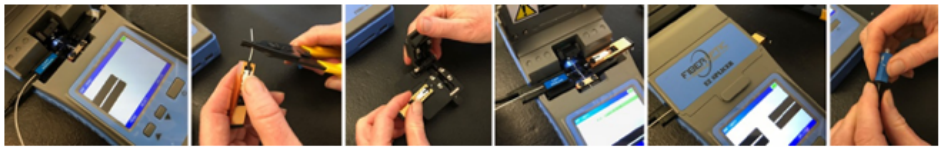
- Remove connector from tool and complete connector assembly
- You're finished

Remove the connector and add the boot and SC body.

The connector is finished.

Prepolished Fusion Splice-On Connector (SOC)





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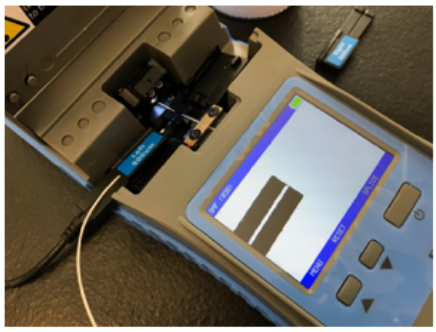
Fusion splice-on connectors (generally called SOCs) are factory polished connectors with a short pigtail in the back, ready for stripping and cleaving, then fusion splicing onto a fiber. They have the same advantages that fusion splicing has over mechanical splicing: lower loss, greater mechanical strength, higher reliability and since they do not have a complex mechanical splice, they are also cheaper.

Termination Process - SOC

- Strip fiber as you would to splice two fibers and place in splicer



Splicing SOCs onto fibers starts with preparing a fiber to splice the connector on. That fiber is stripped and cleaved, then inserted in the fusion splicer.

Note: parts of the connector assembly including the splice protector, backshell of the connector and strain relief must be slid on the mating fiber n correct order before it is prepared for splicing.

Termination Process - SOC

- Place SOC in holder for fusion splicer, strip fiber to proper lenght

The SOC has a pigtail that will be spliced to the fiber. The pigtail needs to be stripped to the correct length for splicing. To start the process, insert the connector into the holder (the gold part) then strip the fiber.

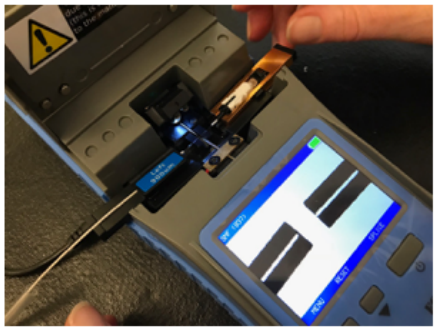
Termination Process - SOC

- Use splicer's precision cleaver to cleave fiber

Insert the connector and holder into the splicer and cleave the fiber. The holder ensures the cleaver will cleave the fiber at the correct length.

Termination Process - SOC

- Place SOC in holder in splicer



After cleaving, insert the holder in the other side of the splicer. You can see the two fibers which will be spliced.

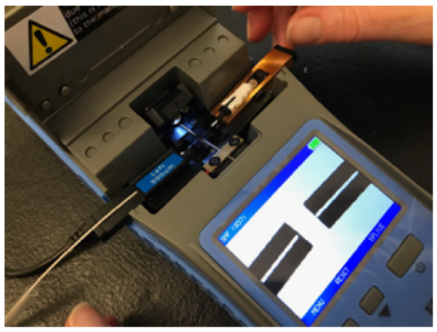
Termination Process - SOC

- Close lid on splicer and initiate splicing process

Close the lid on the splicer and initiate the automatic splicing process.

Termination Process - SOC

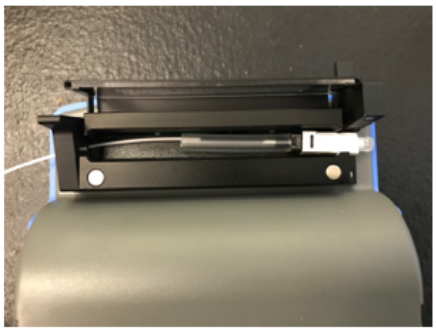
- Remove spliced connector and fiber



When the splice has been made, remove the spliced assembly from the fusion splicer.

Termination Process - SOC

- Heat shrink protector on spliced fiber



Slide the heat-shrink splice protector up on the connector and shrink it onto the fiber.

Termination Process - SOC

- Add connector parts – strain relief and connector body
- You're finished

Slide the connector backshell and strain relief up to the connector and attach them. Your connector is finished.

FOA Guide - Virtual Hands-On

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