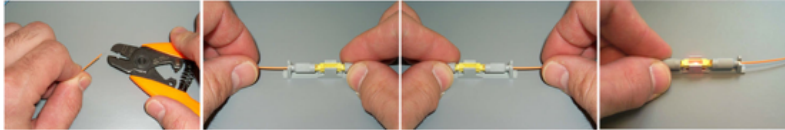


# FOA Reference Guide For Fiber Optics



## Virtual Hands-On Mechanical Splicing



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This FOA virtual hands-on (VHO) tutorial on fiber optics covers fiber optic cable splicing using an mechanical splice 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.

For this section, we will show a Siemon Ultrasplice which is no longer manufactured but is representative of this type of component. Other mechanical splices will be used in a similar fashion, but tooling and procedures are unique to each type.

## Mechanical Splicing

- Using the Siemon Ultrasplice
- Capillary tube alignment
- Locking nuts grip fiber
- Window for VFL alignment
- Can be redone if problems



For the hands-on mechanical splice exercise, we will be using the Siemon Ultrasplice

The Ultrasplice uses a glass capillary tube alignment

Locking nuts grip the fibers

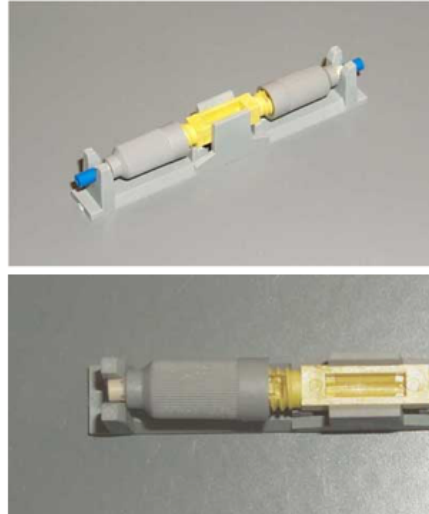
The Ultrasplice has two advantages for splicing

It has a window where you can see the fiber ends in the capillary, useful for positioning the fibers and for active alignment with a VFL (visual fault locator.)

It also is re-enterable. If the splice is not good, the fibers can be removed one at a time, recleaved and the splice attempted again.

## The Siemon Ultrasplice

- Ultrasplice uses a glass capillary to align fibers
- Plastic nuts secure the fibers
- Use with 250, 500 or 900 micron buffered fibers
- Glass tube makes splice visible
- Snap-in holder supplied



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### The Siemon Ultrasplice

Ultrasplice uses a glass capillary to align fibers

Plastic nuts secure the fibers

Use with 250, 500 or 900 micron buffered fibers

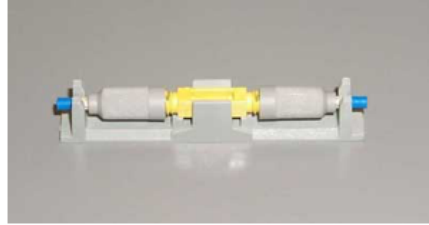
Glass tube and the "window" makes the splice visible - you can actually see the fibers as they are inserted - and allows "tuning" with visible fault locator

Shown in fixture for termination. The snap-in holder shown can be used to secure the fiber in patch panels or splice trays

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

## For 250 or 500 Micron Buffer

- For 250 or 500 micron buffer fiber common to loose tube cables, the Ultrasplice is ready to use
- The blue tubes at each end hold 250 or 500 micron buffer fiber securely
- The snap-in holder can be used to secure the fiber in patch panels or splice trays



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For 250 or 500 micron buffer fiber, the Ultrasplice is ready to use

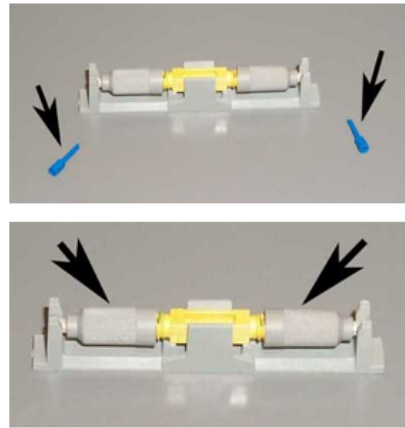
The blue tubes at each end hold 250 or 500 micron buffer fiber securely

The snap-in holder shown can be used to secure the fiber in patch panels or splice trays

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

## For 900 Micron Buffer Fiber

- If the fiber being spliced has a 900 micron buffer coating, typical of most tight buffer cables (simplex, zipcord and distribution cable), remove the blue plastic guide tubes
- Loosen locking nuts 1/2 turn



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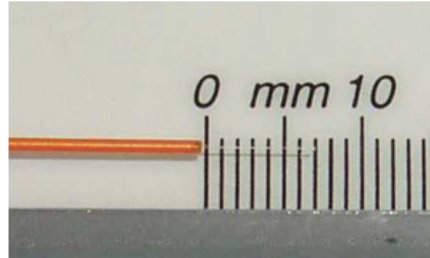
### For 900 Micron Buffer Fiber

If the fiber being spliced has a 900 micron buffer coating, typical of most tight buffer cables (simplex, zipcord and distribution cable), remove the blue plastic guide tubes  
Loosen locking nuts 1/2 turn

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

## Fiber Stripping/Cleaving Guide

- The fiber should be stripped and cleaved to 7 mm bare fiber beyond the buffer
- Accurate stripping helps make good splices and provides reliable grip on fiber



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### Fiber Stripping Guide

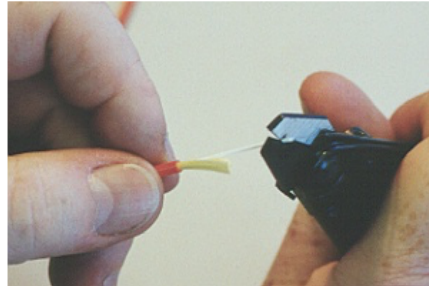
The fiber should be stripped and cleaved to 7 mm bare fiber beyond the buffer

Accurate stripping helps make good splices and provides reliable grip on fiber

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

## Stripping Fibers

- Most critical phase of splicing where fiber damage is most likely
- Try to avoid nicks or cuts as it weakens fiber
- Be careful cleaning and placing fiber in holders on cleaver or splicer too



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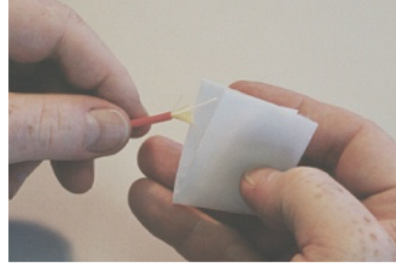
Stripping fibers is the most critical phase of splicing where fiber damage is most likely to occur.

Try to avoid nicks or cuts as it weakens fiber and can cause long term reliability problems

Be careful cleaning the fiber and inserting it in the splice also

## Cleaning Fiber

- Clean fiber
  - Wipe with lint-free wipe and isopropyl alcohol
  - Careful - do not break fiber!



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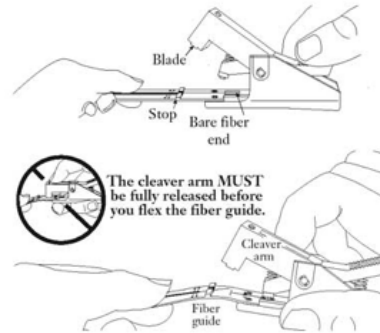
Place an alcohol pad between your thumb and forefinger, and wipe the fiber between them.

Careful- do not break the fiber!



## Cleaving - Simple Cleaver

- With the simple cleaver
- Hold the bare fiber end with the spring-loaded clamp and your thumb
- Lightly touch the fiber with the cleaver arm to score the fiber
- Flex the fiber guide to break the fiber



Most mechanical splice kits include an inexpensive, simple cleaver. Better and more consistent splices may be made with a cleaver of the type used with fusion splicers. To cleave with the simple cleaver:

Hold the bare fiber end with the spring-loaded clamp and your thumb

Lightly touch the fiber with the cleaver arm to score the fiber. Only a light touch is needed. A heavy clamping can break the fiber or cause a bad cleave

Release the cleaver arm fully

Flex the fiber guide to break the fiber

Remove the fiber. You are ready to insert the fiber in the connector.

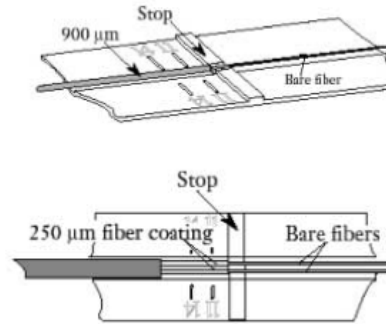
**BE CAREFUL** to not break the fiber or touch it to anything as that will attract dirt which will adversely affect the cleave.

**CAREFULLY REMOVE THE FIBER END AND DISPOSE OF IT CAREFULLY!**

See next slide for more detail

## Simple Cleaver

- Loading fiber on the fiber guide
- 900  $\mu\text{m}$  buffer at the stop
- 250  $\mu\text{m}$  buffer at the stop also, not the furcation tubing



Loading fiber on the fiber guide. You may cleave either 900  $\mu\text{m}$  tight buffer fiber or 250  $\mu\text{m}$  buffer fiber from a loose tube cable with furcation tubing.

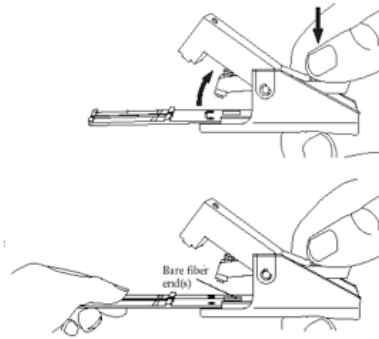
900  $\mu\text{m}$  buffer fits on the fiber guide at the stop

With 250  $\mu\text{m}$  buffer, align the buffer at the stop also, not the furcation tubing

See next slide for more detail

## Cleaver

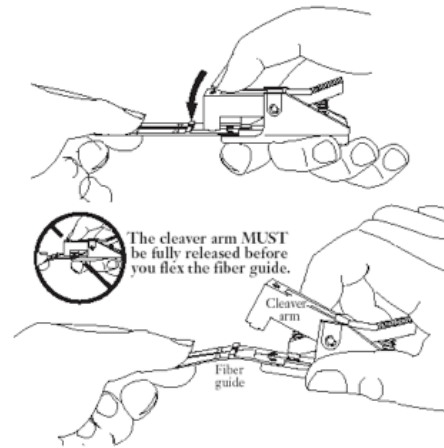
- Clamp the fiber under the end of the arm on the spring-loaded lever



Clamp the fiber under the end of the arm on the spring-loaded lever

## Simple Cleaver

- Hold the bare fiber end with the spring-loaded clamp and your thumb
- Lightly touch the fiber with the cleaver arm to score the fiber
- Flex the fiber guide to break the fiber



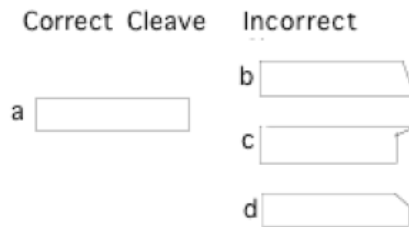
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Hold the bare fiber end with the spring-loaded clamp and your thumb  
Lightly touch the fiber with the cleaver arm to score the fiber  
Flex the fiber guide to break the fiber

## Inspect The Cleaved Fiber

- Some microscopes allow checking fiber cleaves before insertion in a splice
- A good cleave will be perpendicular to the fiber and have a flat end surface



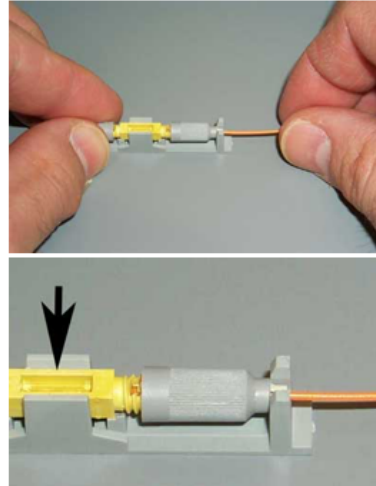
### Inspect The Cleaved Fiber

Some microscopes allow checking fiber cleaves before insertion in a splice

A good cleave will be perpendicular to the fiber and have a flat end surface

## Insert First Fiber

- Carefully insert one fiber into the splice
- Watch the window and make sure the fiber end is in the middle of the window



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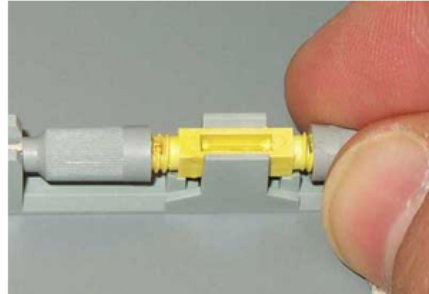
Carefully insert one fiber into the splice

Watch the window and make sure the fiber end is in the middle of the window

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

## Secure First Fiber

- Tighten the gray nut to secure the fiber
- Tighten it “finger tight” only - do not overtighten as it can cause attenuation in the fiber



### Secure First Fiber

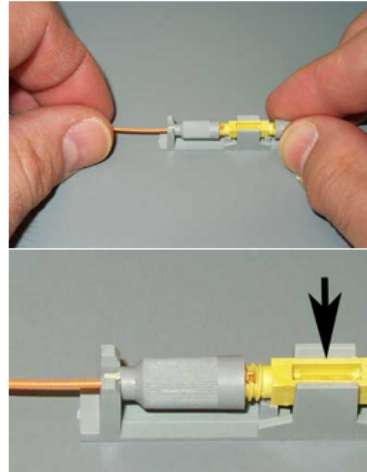
Tighten the gray nut to secure the fiber

Tighten it “finger tight” only - do not overtighten as it can cause attenuation in the fiber

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

## Insert Second Fiber

- Carefully insert second fiber into the splice
- Watch the window and make sure the fiber end contacts the first fiber
- Tighten the gray nut to secure the fiber



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### Insert Second Fiber

Carefully insert second fiber into the splice

Watch the window and make sure the fiber end contacts the first fiber

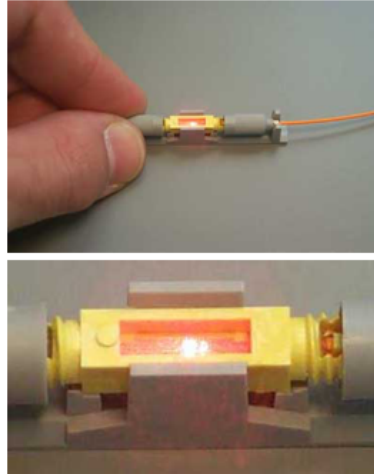
Tighten the gray nut to secure the fiber

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.



## Optimizing the Splice - VFL Method

- VFL - shine a visual fault locator into the fiber
- Unlock one splice locking nut
- Pull that fiber out by 1mm (about 1/16 inch)
- Rotate the fiber about 30° and reinsert
- Watch for minimal light



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You can sometimes improve the loss of a mechanical splice by gently withdrawing one of the fibers a slight amount, rotating it slightly and reinserting it.

Try this with your splice.

It works best with a VFL (visual fault locator)

Shine a visual fault locator into the fiber and note the light loss at the splice

Unlock one splice locking nut

Pull that fiber out by 1mm (about 1/16 inch)

Rotate the fiber !30 degrees and reinsert fully

Keep trying and watch for minimal light

Retighten nut

Photos courtesy of Siemon, Corp. manufacturer of the Ultrasplice.

Included on the CD is a short movie on using a VFL to optimize an Ultrasplice

Filename:250UltraSplice.asf

## Optimizing the Splice - Meter/Source

- Using a power meter and source
- Attach the spliced cable to the meter and source
- Record meter reading
- Unlock one splice locking nut
- Pull that fiber out by 1mm (about 1/16 inch)
- Rotate the fiber 30 degrees and gently reinsert
- Note the power meter reading. Did the loss increase or decrease?



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You can sometimes improve the loss of a mechanical splice by gently withdrawing one of the fibers a slight amount, rotating it slightly and reinserting it.

You can monitor splice loss with a meter and source if your cable has connectors on each end.

Try this with your splice.

Using a power meter and source

Attach the spliced cable to the meter and source

Record meter reading

Unlock one splice locking nut

Pull that fiber out by 1mm (about 1/16 inch)

Rotate the fiber 30 degrees and gently reinsert

Note the power meter reading. Did the loss increase or decrease?

Finish the splice by locking the gray nut

# FOA Guide - Virtual Hands-On

*By*

**The Fiber Optic Association, Inc.**

1-760-451-3655 Fax 1-781-207-2421  
Email: [info@foa.org](mailto:info@foa.org) <http://www.foa.org>



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