

FOA Reference Guide For Fiber Optics



Virtual Hands-On Ribbon Fusion Splicing



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This FOA virtual hands-on (VHO) tutorial on fiber optics covers fiber optic cable splicing using a typical ribbon fusion splicer. It is copyrighted by the FOA and may not be distributed without FOA permission.

For this section, we will show a Corning ribbon splicer demonstrated by Corning personnel. Other splicers work in a similar fashion, but the user must always refer to the manuals or fiber optic product trainers for the proper procedures for the splicer being used.

Our thanks to Corning Cable Systems for their assistance in preparing this tutorial.

Safety Rules

- Read and follow rules in lab manual
- Wear safety glasses
- Dispose of fiber scraps carefully
- Careful with chemicals
- No eating, drinking or smoking
- Splice in well-ventilated areas where no flammable gasses are present!
- **DO NOT OPERATE THE STRIPPER, FIBER CLEAVER OR FUSION SPLICER UNLESS YOU HAVE BEEN PROPERLY TRAINED**



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!

Wear safety glasses whenever doing hands-on exercises

Dispose of fiber scraps carefully in a closable, disposable bin, preferably like deli soup containers with a lid.

Be careful with chemicals. Alcohol is highly flammable and some chemicals are not good to breathe so work in well-ventilated spaces.

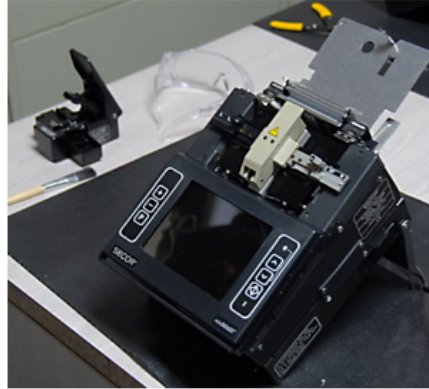
No eating or drinking, smoking either.

A note on fusion splicing: The electric arc used to splice fibers can cause explosions if flammable gasses are present! Splice in well-ventilated areas where you are positive that no flammable gasses are present!

**DO NOT OPERATE THE FIBER CLEAVER OR FUSION SPLICER UNLESS YOU
HAVE BEEN PROPERLY TRAINED**

Ribbon Splicing Tools

- You will need:
 - Ribbon splicing machine
 - Ribbon fiber stripper
 - Ribbon fiber cleaver
 - Cleaning wipes



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For this ribbon splicing exercise, you will need:

Ribbon splicing machine

Ribbon fiber stripper

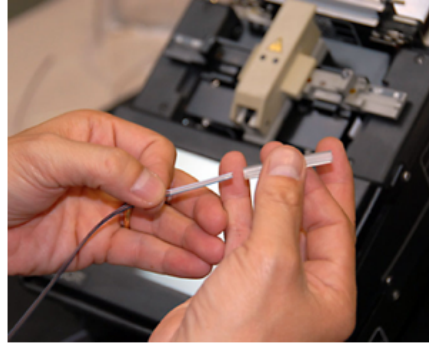
Ribbon fiber cleaver

Cleaning wipes or lint-free wipes and pure isopropyl alcohol

Ribbon splicing uses special (and more expensive) tools but the process is simplified by these more sophisticated devices.

Splice Protection Sleeve

- First slide the splice protection sleeve on the ribbon - this is the only chance you get so don't forget it!



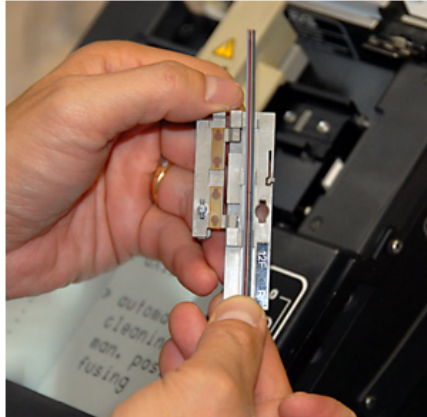
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First slide the splice protection sleeve on the ribbon - this is the only chance you get so don't forget it! If you splice the ribbons without it, you'll have to break the ribbon and start over.

Ribbon Fixtures

- Remove one of the fiber holding fixtures from the splicer
- Place the ribbon in the fixture from the splicer
- Leave sufficient ribbon protruding to allow for stripping and cleaving
- Watch that you keep the color codes straight!



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Ribbon Fixtures

Remove one of the fiber holding fixtures from the splicer

Place the ribbon in the fixture from the splicer and gently clamp the holders

Leave sufficient ribbon protruding to allow for stripping and cleaving. See manufacturer's specifications.

Watch that you keep the color codes straight! You will want to slice the ribbon so that the color codes are correct across the splice!

Stripping Ribbon

- Place the fixture from the splicer holding the ribbon into the stripper
- The stripper will heat the ribbon to the proper temperature for stripping



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Stripping Ribbon

Place the fixture from the splicer holding the ribbon into the stripper

The stripper will heat the ribbon to the proper temperature for stripping

Stripping Ribbon

- Close the stripper
- Wait for ribbon to heat



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Stripping Ribbon

Close the stripper on the ribbon and the fixture

Wait for ribbon to heat - there will be an indicator when the stripper is ready

Stripping Ribbon

- Pull the fixture holder back to strip the ribbon



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Stripping Ribbon

Pull the fixture holder back firmly and completely to strip the ribbon

Stripping Ribbon

- Open the stripper and remove the fiber and fixture



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Stripping Ribbon

Open the stripper and remove the fiber and fixture

Stripping Ribbon

- Using a lint-free cloth, clean the ribbon
- It is now ready for cleaving



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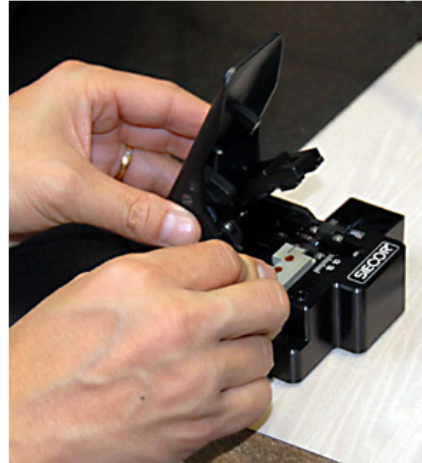
Stripping Ribbon

Using a lint-free cloth, clean the ribbon

It is now ready for cleaving

Cleaving Ribbon 1

- Insert the fixture holding the ribbon into the cleaver, making sure it is in the correct position



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Cleaving Ribbon

Insert the fixture holding the ribbon into the cleaver, making sure it is in the correct position

Cleaving Ribbon 2

- Following the cleaver directions exactly, close the cleaver and finish the cleave



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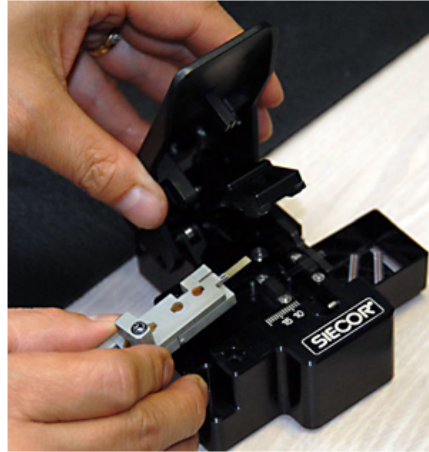
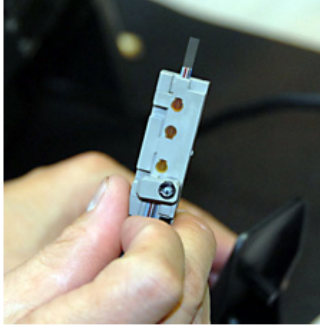
Cleaving Ribbon

Following the cleaver directions exactly, close the cleaver and finish the cleave. Some cleavers have multiple steps to follow while others are one-step.

It is very important to follow directions exactly!

Cleaving Ribbon 3

- Carefully remove the fixture with the cleaved fibers from the cleaver



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Cleaving Ribbon

Carefully remove the fixture with the cleaved fibers from the cleaver. Be careful when handling the cleaved fiber and placing it in the splicer to prevent getting it dirty or damaging it.

Here is the cleaved ribbon ready for placement into the splicer. Be careful when handling the cleaved fiber and placing it in the splicer to prevent getting it dirty or damaging it.

This cleaver holds the scraps. Dispose of all scraps properly.

Place Fixture Into Splicer

- Place the fixture and cleaved fiber into the splicer and lock it in place
- Make certain it is properly inserted and the fiber lengths are correct (they should be near the electrodes)



Place Fixture Into Cleaver

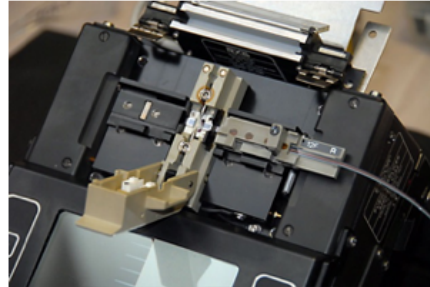
Place the fixture and cleaved fiber into the splicer and lock it in place

Make certain it is properly inserted and the fiber lengths are correct (they should be near the electrodes)

We'll say it one more time: Be careful when handling the cleaved fiber and placing it in the splicer to prevent getting it dirty or damaging it.

First Ribbon Is Ready

- The first ribbon is ready
- Confirm the placement in the splicer display

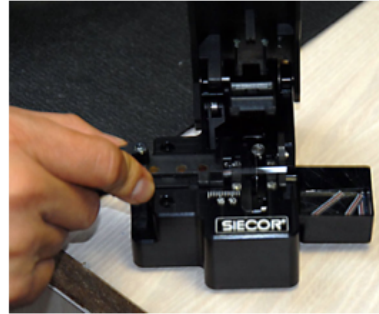


First Ribbon Is Ready

The first ribbon is ready. Confirm the placement in the splicer display. Check the ends of the fibers to make sure all fibers look properly cleaved and clean. The splicer may use a prefuse program here to clean the fibers.

Cleave Second Ribbon

- Following the same procedure, strip and cleave the second ribbon
- The fixture for the second ribbon is a different color on the Corning splicer, since they are not interchangeable
- Keep color codes straight!



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Cleave Second Ribbon

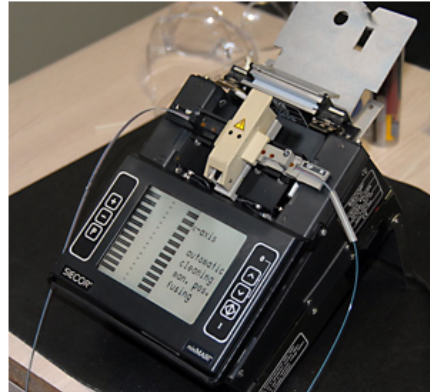
Following the same procedure, strip and cleave the second ribbon

The fixture for the second ribbon is a different color on the Corning splicer, since they are not interchangeable

Remember to keep the color codes straight so the final fused ribbon has the colors spliced straight through!

Insert Second Ribbon

- Following the same procedure, insert the second ribbon in the splicer
- Close the cover over the splicing electrodes
- Check the display



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Insert Second Ribbon

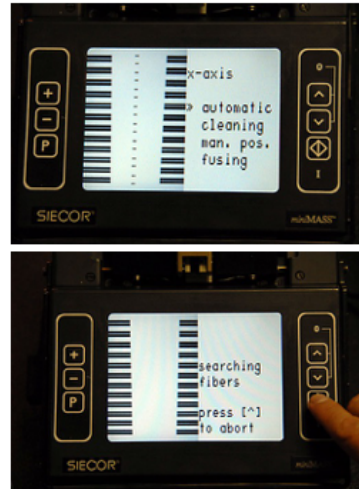
Following the same procedure, insert the second ribbon in the splicer and lock the fixture in place

Close the cover over the splicing electrodes and you are ready to go

Check the display to inspect the fibers and make sure each ribbon is properly cleaved and positioned in the splicer

Automated Splice Procedure 1

- The splicer must be programmed for the parameters required by the fibers in the ribbons
- Once programmed, the process is automatic
- Fibers are prefused, aligned and spliced



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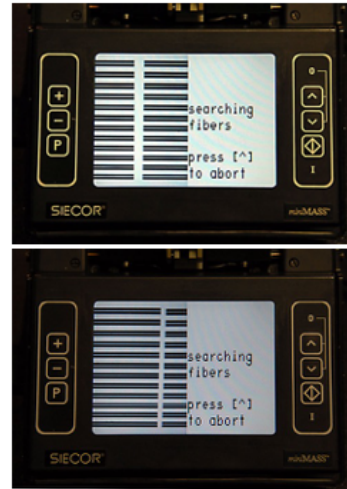
Automated Splice Procedure

The splicer must be programmed for the parameters required by the fibers in the ribbons. The manufacturer of the splicer will provide proper data.

Once programmed, the process is automatic: Fibers are cleaned/prefused, aligned and spliced

Automated Splice Procedure 2

- The splicer will search and align the fibers
- As part of the process, the fibers will be moved around to get data and align fibers



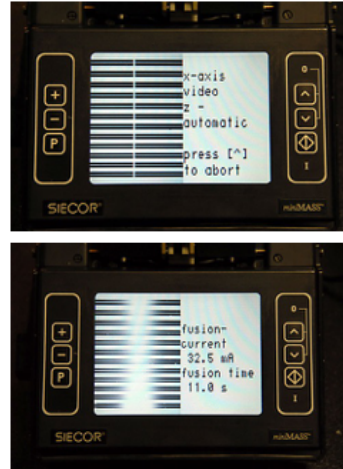
Automated Splice Procedure

The splicer will search and align the fibers

As part of the process, the fibers will be moved around to get data and align fibers

Automated Splice Procedure 3

- The splicer will search and align the fibers
- When ready, the display shows the actual fusion process (lower)



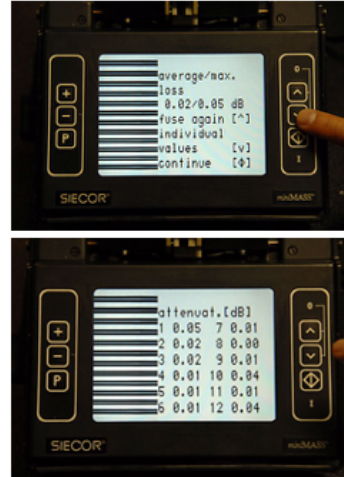
Automated Splice Procedure

The splicer will search and align the fibers

When ready, the Corning display shows the actual fusion process (lower) and the parameters used

Automated Splice Procedure 4

- After splicing, the machine will estimate the loss of each fiber and provide individual and overall data
- Confirm that all fibers are within specification
- Resplice if necessary



Automated Splice Procedure

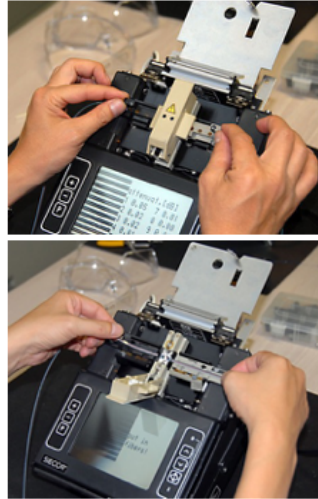
After splicing, the machine will estimate the loss of each fiber and provide individual and overall data, based on the profile alignment system, and problems

Confirm that all fibers are within specification

Resplice if necessary

Release Ribbons

- Carefully unlock the fixtures
- Open the lid over the splice
- Open the fixtures and lift out the spliced ribbons



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Release Ribbons

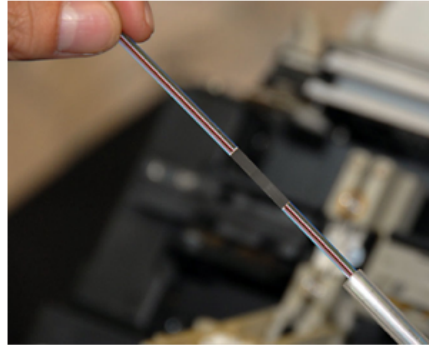
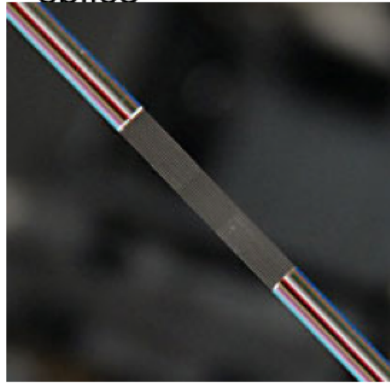
Carefully unlock the fixtures

Open the lid over the splice

Open the fixtures and lift out the spliced ribbon - being very careful not to stress the splice before it is protected

Finished Ribbon Splice

- Here is the finished splice



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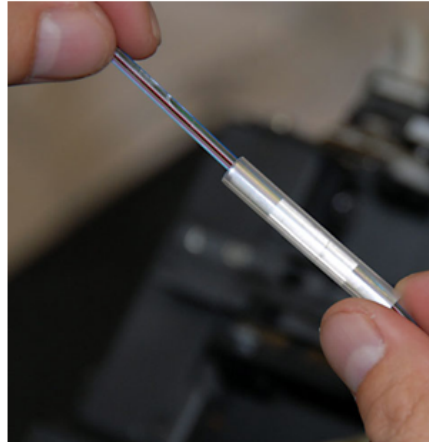
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Finished Ribbon Splice

Here is the finished ribbon splice awaiting the protection sleeve shown in the bottom of the right photo. Note the color codes are continued across the splice

Adding Protection Sleeve 1

- Slide the protection sleeve over the ribbon carefully, aligning it over the center of the stripped ribbon and fused splice

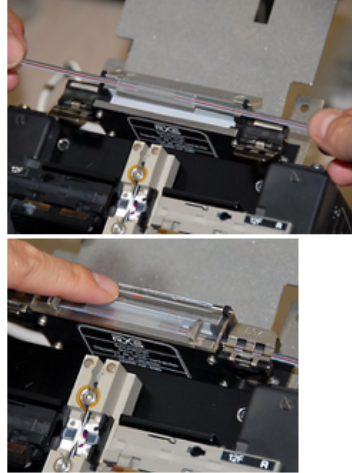


Adding Protection Sleeve

Slide the protection sleeve over the ribbon carefully, aligning it over the center of the stripped ribbon and fused splice.

Adding Protection Sleeve 2

- Insert the ribbon into the heat shrink heater on the splicer and start the heating process
- When the process is finished (indicated by a visible or audible signal), remove the ribbon



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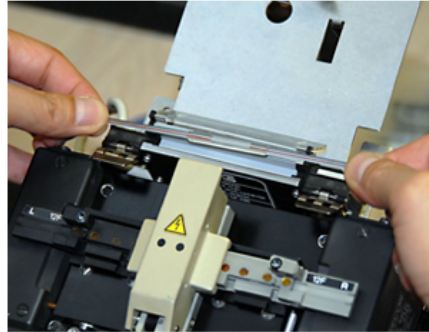
Adding Protection Sleeve

Insert the ribbon into the heat shrink heater on the splicer and start the heating process

When the process is finished (indicated by a visible or audible signal), remove the ribbon

Ribbon Splicing - Done!

- Carefully open the heater door and remove the completed ribbon splice
- The ribbon is now ready for placement in a splice tray or closure



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Ribbon Splicing

Carefully open the heater door and remove the completed ribbon splice

The ribbon is now ready for placement in a splice tray or closure

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