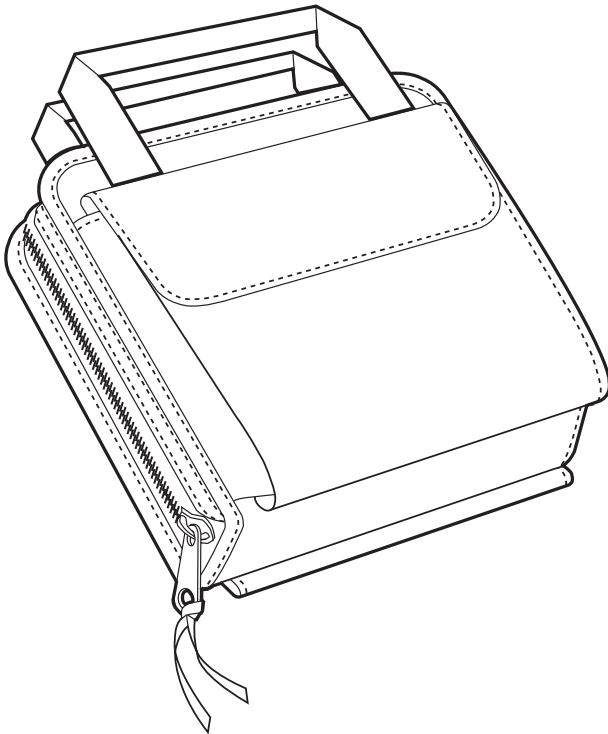




## Fiber Connector Tool Kit



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**CUSTOMER  
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INFORMATION**

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FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**  
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## **TRADEMARKS USED IN THIS MANUAL**

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Loctite and Prism are registered trademarks of Loctite Corporation.

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# 1. Introduction

Before you begin using the Fiber Connector Tool Kit, compare the Kit to the packing list below and the illustration on the next page to make sure you have a complete Kit.

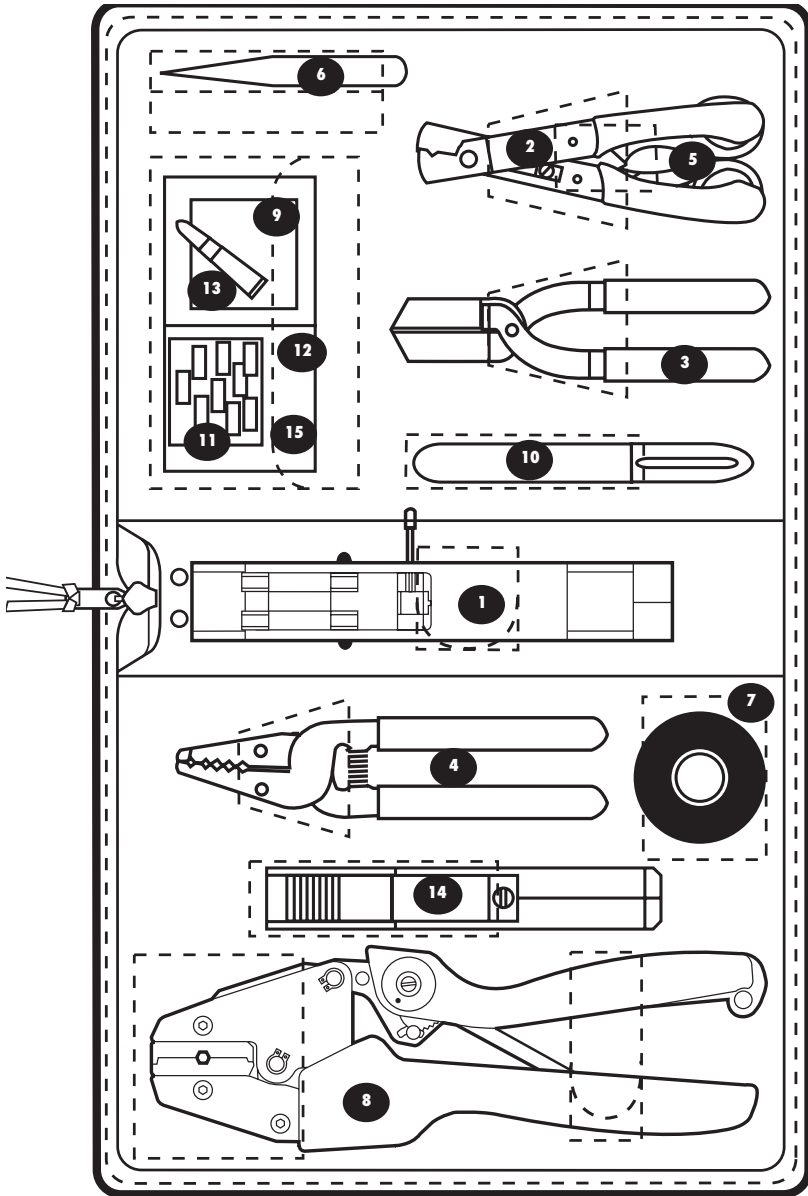
<b>Illustration Number</b>	<b>Quantity</b>	<b>Description</b>
1	(1)	Universal Installation Tool (ST, SC, FC)
2	(1)	Fiber Stripping Tool
3	(1)	No-Nik® 200-µm Tool
4	(1)	Plier-Type Buffer Tube Stripper
5	(1)	Electrician Scissors, 2-inch
*	(1)	Book of Number Labels
6	(1)	Tweezers
7	(1)	Roll of Electrician Tape, ¾"
8	(1)	Crimp Tool
9	(6)	Alcohol Wipes
10	(1)	Fine-Point Permanent Marker
11	(1)	Package Spiral Wrap Assembly
12	(1)	Strip Length Gauge
13	(1)	Tube of 411 Adhesive
14	(1)	Fiber Cleaver
15	(5)	Adhesive Foam Strips (Replacement Foam)
*	(1)	Tool Registration Card
	(1)	Assembly Video

\* The item is located in the outside pocket.

Now take a few minutes to examine the tools. Make sure that each one seems to be in good working order.

This manual contains the recommended assembly procedure (**Chapter 2**), as well as additional information on particular tools (**Chapters 3, 4, 5, and 6**) and safety information (**Chapters 7 and 8**). If you have any questions about the kit that are not resolved by reading this manual or watching the assembly video, call your supplier.

# FIBER CONNECTOR TOOL KIT



## 2. Assembling the Connectors

In this chapter you'll learn how to assemble the Pre-Polished Fiber Connectors ST (FO031-R2), SC (FO032), and FC (FO033). Each of these connectors is a field-installable connector that does not require epoxy or polishing. The connector incorporates a fiber stub that is bonded into a ferrule and polished in the factory, not in the field.

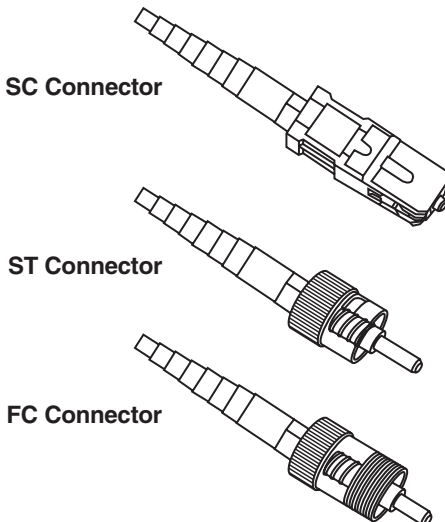
The field fiber is cleaved and inserted into the connector so that it touches the cleaved end of the fiber stub. When the cam is rotated, both cleaved ends are pressed into precise alignment inside the connector and held in place.

After strain-relieving the fiber to the connector, it is ready to be mated to another connector inside an adapter.

The Pre-Polished Fiber Connector will fit the following fiber types:

- 900- $\mu\text{m}$  tight-buffered fibers
- 3-mm single-fiber cables
- 250- $\mu\text{m}$  furcated fibers

*Read through the entire procedure before starting to assemble the connector.*

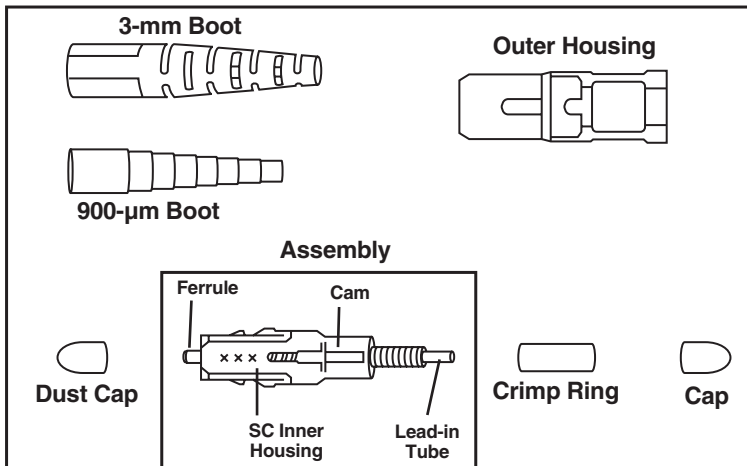


**Components**

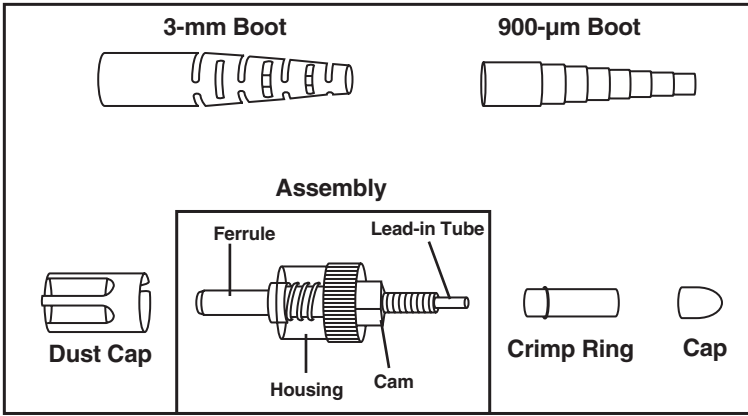
Each Pre-Polished Fiber Connector package contains the parts listed in Figures 1 through 3 for the type connector desired.

**NOTE**

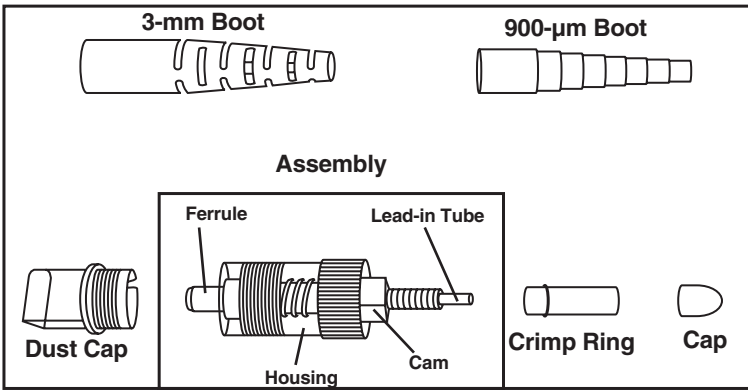
**Do not remove the dust cap from the front end of the ferrule until you have completed this procedure, and you are ready to install the completed connector in a sleeve.**



**Figure 1. SC Parts.**



**Figure 2. ST® Parts.**



**Figure 3. FC Parts.**



**Precautions****WARNING!**

When handling chemicals or cutting fiber, always wear safety glasses to protect your eyes from accidental injury. Pieces of glass fiber are very sharp and can damage the cornea of the eye easily.

**WARNING!**

Cleaved glass fibers are sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area where they can cause injury later. Use tweezers to pick up cut or broken pieces of the glass fibers and place them on a loop of tape kept for that purpose alone.

**WARNING!**

Isopropyl alcohol is flammable, with a flashpoint of 54°F (12°C). It can cause irritation to eyes on contact. In case of eye contact, flush eyes with water for at least 15 minutes. Inhaling fumes may induce mild narcosis. In case of ingestion, consult a physician. Use with adequate ventilation.

**CAUTION**

Fiberoptic cable is sensitive to excessive pulling, bending, and crushing forces. Consult the cable specification sheet for the cable you are installing. Do not bend cable more sharply than the minimum recommended bend radius. Do not apply excessive pulling force to the cable or allow it to kink. Doing so may cause damage that can alter the transmission characteristics of the cable, and the cable may have to be replaced.

**WARNING!**

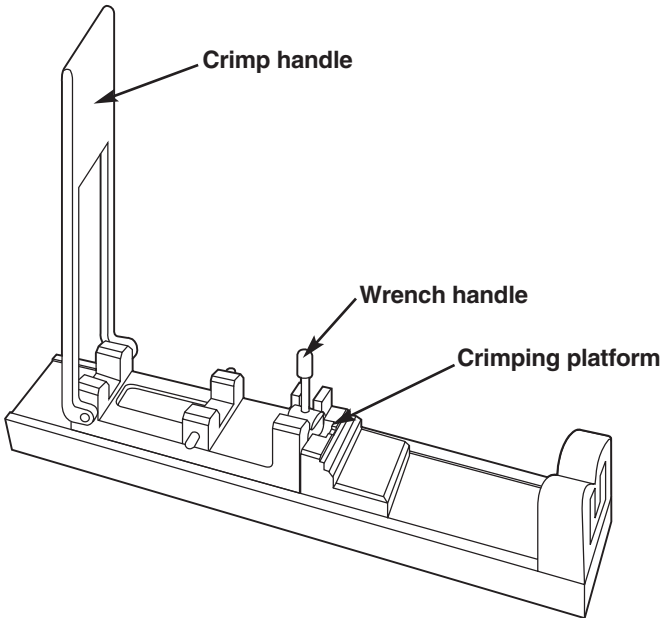
Laser light can damage your eyes. Laser light is invisible. Viewing it directly does not cause pain. The iris of the eye will not close involuntarily as when viewing a bright light. Consequently, serious damage to the retina of the eye is possible. Never look into the end of a fiber which may have a laser coupled to it. If you suspect accidental eye exposure to laser light, arrange for an eye examination immediately.

## Connector Preparation

### NOTE

**This section describes connector preparation for all styles of connectors, but figures depict only the SC connector.**

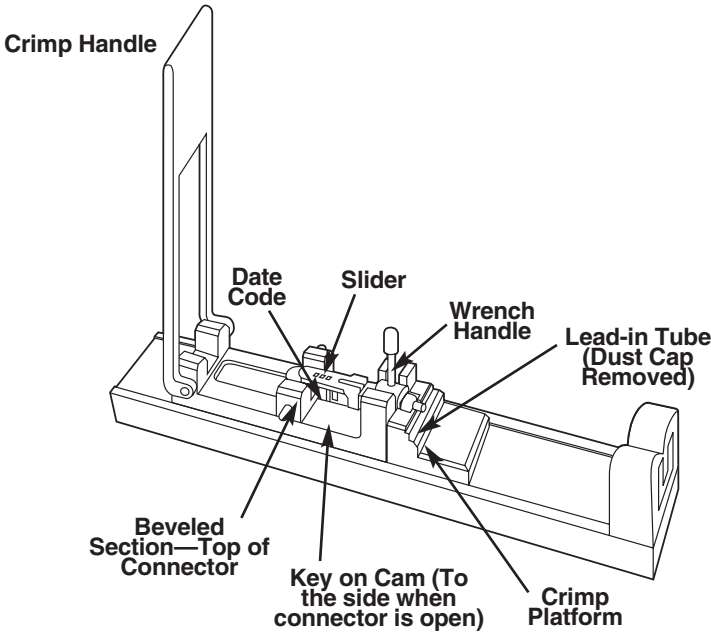
- 1) The Universal Installation Tool you will use is a special tool designed to position the fiber into the Pre-Polished Fiber Connector, rotate the cam that aligns the fibers, and crimp the fiber in place. The tool makes connector assembly easy and accurate. A separate crimp tool is required to secure the aramid yarn on the interconnect cable.
- 2) Flip the crimp handle open and rotate the wrench so the handle is up.



**Figure 4. Universal Installation Tool.**

- 3) Remove and discard the cap from the rear of a connector. *Do NOT remove the front dust cap until the connector is completely assembled and you are ready to install it in an adapter.*

4) Examine the connector to make sure it is in the open position. For the SC, the connector is in the open position, when the key on the cam is positioned 90° from the date-code printing on top of the connector. You'll notice that the connector will not fit into the installation tool unless it is in the open position. For the ST or FC connector, the rounded side of the dust cap with the label "UP" must be up as the connector is inserted into the tool.



**Figure 5. Putting the Connector into the Tool.**

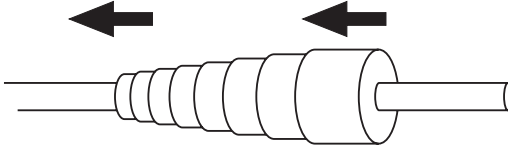
5) Pull back the slider and insert the connector into the tool as far as it will go. *The lead-in tube should rest on the crimp platform when the connector is fully seated.* The front of the connector should rest in the slider.

### **IMPORTANT!**

**A gentle push should be adequate to insert the connector. Do not attempt to force the connector into the tool. Doing so could damage the connector. If the connector does not slide into the tool when gently pushed, check to make sure the connector is in the open position, the wrench handle is up, and you are inserting the connector in the correct way.**

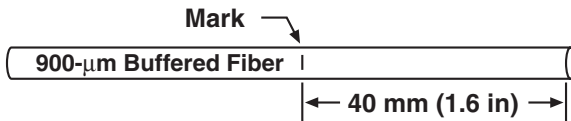
## Fiber Preparation: 900- $\mu\text{m}$ Tight-Buffered Fiber

1) Slide the 900- $\mu\text{m}$  boot (small end first) down the fiber until it is out of the way.



**Figure 6. Sliding the Boot Down the Fiber.**

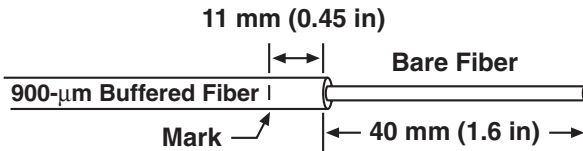
2) Measure and mark 40 mm (1.16 in.) from the end of the buffered fiber.



**Figure 7. Mark the Fiber.**

3) Remove this 40-mm section with the 200- $\mu\text{m}$  No-Nik Tool.

4) Mark the buffer 11 mm (0.45 in.) back from the strip point with a permanent-ink marker.



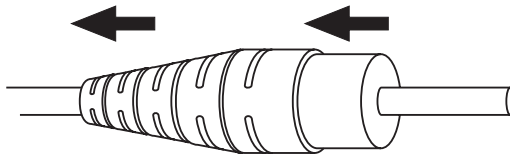
**Figure 8. Mark the Buffer Tube.**

5) Clean the bare fiber with two passes of an alcohol wipe. Do not touch the bare fiber after cleaning it. Do not remove the 11 mm mark.

Go to the section titled *Connector Installation* on **page 16**.

### **Fiber Preparation: 3-mm Single-Fiber Cable**

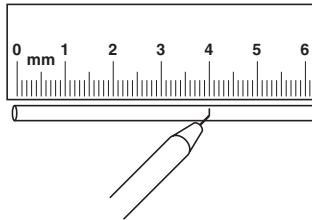
1) Slide the 3-mm boot (small end first) down the fiber until it is out of the way.



**Figure 9. Sliding the Boot Down the Fiber.**

*Take your time and do the next four steps correctly.* Excessive yarn length will have to be trimmed later. Yarn too short may result in weak strain relief for the connector.

2) Measure and mark 40 mm (1.5 in.) from the end of the cable's outer jacket.



**Figure 10. Mark the Fiber.**

3) Strip off the 40-mm section of outer jacket with the 16-AWG opening of the buffer-stripping tool.

4) Trim the aramid yarn flush to the end of the outer jacket.

5) Measure and mark 12 mm (0.5 in.) from the end of the outer jacket.

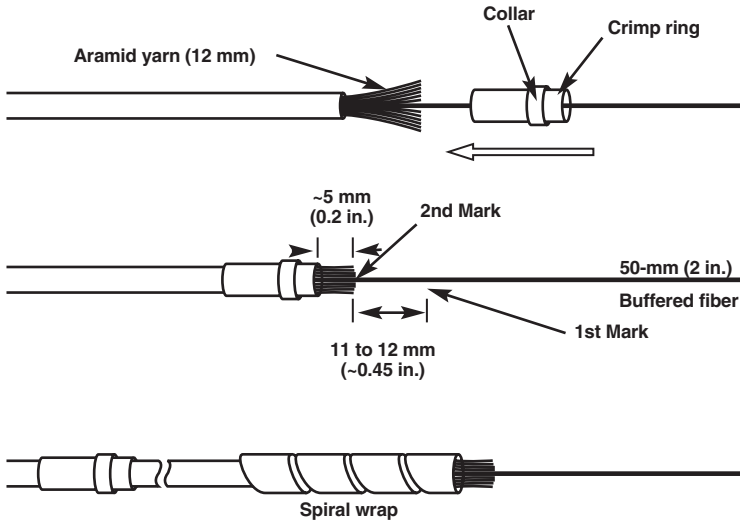
## FIBER CONNECTOR TOOL KIT

6) Strip off the 12-mm section of outer jacket. You should have 12 mm of aramid yarn showing.

7) Fold the aramid yarn back over the cable jacket and slide the crimp ring about 5 mm (0.2 in.) down the yarn to hold it out of the way.

### IMPORTANT!

**Orientation of the crimp ring is critical on ST and FC connectors. Make sure the crimp rings collar is toward the "fiber end" of the cable.**

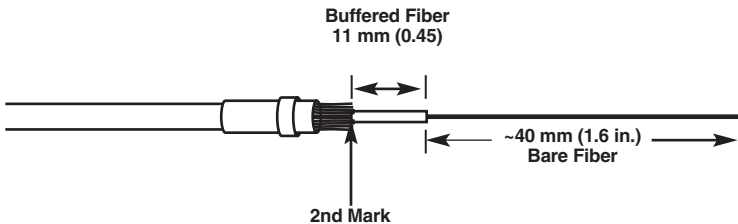


**Figure 11. Aramid Yarn Positions.**

Option: If you have trouble making the crimp ring slide over the cable jacket and the folded yarn, use the option listed on the next page.

- Slide the crimp ring back off the buffered fiber.
- Straighten the yarn back to its original direction.
- Slide the crimp ring over straightened yarn and then down the jacket toward the boot.
- Fold the yarn back over the jacket again and secure with a piece of the spiral wrap provided with the tool kit.

8) Measure and mark the fiber buffer 11 to 12 mm (0.45 to 0.5 in.) from the end of the cable jacket. Place an additional mark on the buffer at the edge of the jacket.



**Figure 12. Stripped Bare Fiber.**

9) Remove approximately 40 mm (1.6 in.) of buffer with the No-Nik tool by stripping to the first mark.

### **IMPORTANT!**

**Check the location of the second mark after stripping. It must be near the edge of the jacket. If necessary, work the buffer back into its original position in the jacket as follows:**

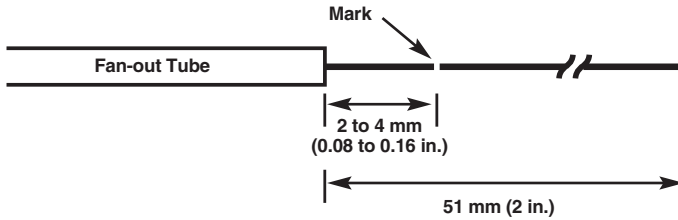
- **Grasp the cable about 60 cm (2 ft.) behind the strip point.**
- **Pull the cable until the second mark is again near the jacket.**

10) Clean the bare fiber with two passes of an alcohol wipe. Do not touch the bare fiber after cleaning it.

Go to the section titled *Connector Installation* on **page 16**.

## Fiber Preparation: 250- $\mu$ m Fan-Out Cable (Buffer Tube or Ribbon)

1) Slide the boot (small end first) down the cable.

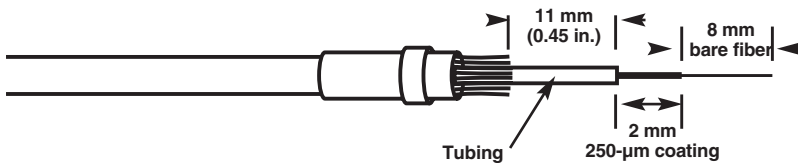


**Figure 13. Buffer Tube Fan-Out Kit.**

2) Make sure that 51 mm (2 in.) of 250- $\mu$ m fiber protrude from the end of the fan-out tubing.

3) Measure and mark the 250- $\mu$ m-coated fiber 4 mm from the end of the fan-out tube.

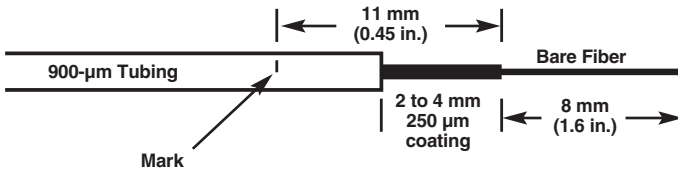
4) Remove the 250- $\mu$ m coating to the 4 mm mark with a Fiber Stripping Tool. It is important to leave 2 to 4 mm of 250- $\mu$ m fiber extending beyond the 900- $\mu$ m tubing. This allows the fibers to touch before the 900- $\mu$ m tubing bottoms out inside the connector.



**Figure 14. Spider Fan-Out.**



5) Mark the fan-out tube 11 mm (0.45 in.) back from the strip point with a permanent marker.



**Figure 15. Mark the Fiber.**

6) Clean the bare fiber with two passes of an alcohol wipe. Do not touch the bare fiber after cleaning it. Do not remove the 11-mm mark.

Go to the next section, *Connector Installation*.

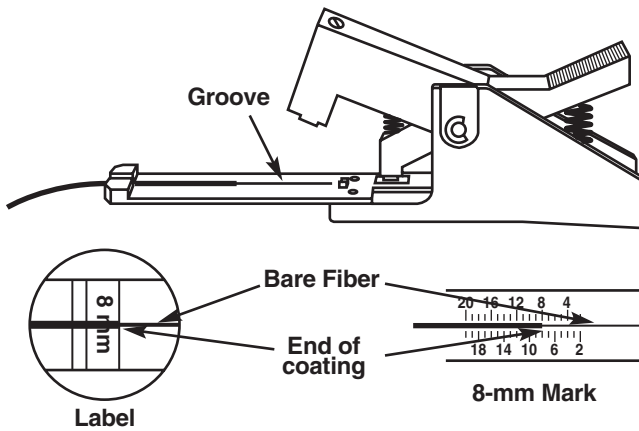
## Connector Installation

### NOTE

**This section describes connector installation for all styles of connectors, but figures only depict the SC connector.**

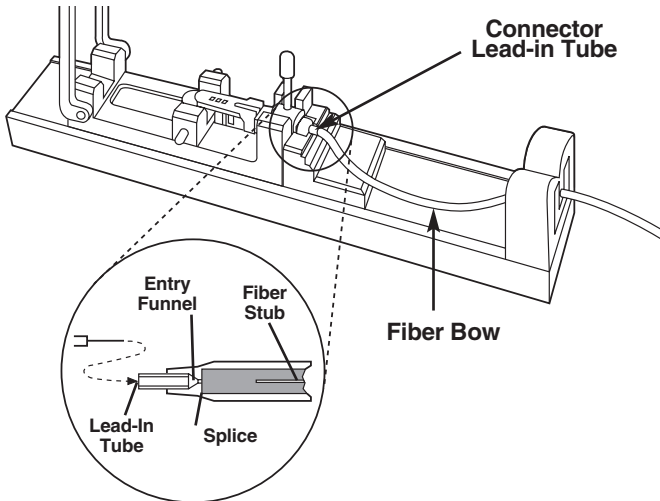
1) Cleave the bare fiber as described in **Chapter 5, Fiber Cleaver**. If you are using a different cleaver, cleave the fiber to 8 mm. The Pre-Polished Fiber Connector accepts cleaved lengths of 8.0 to 8.5 mm (0.32 to 0.33 in.).

For fan-out cable, cleave 8 mm from the end of the 250- $\mu\text{m}$  coating (not the tubing).



**Figure 16. Cleaver Guides.**

2) After following steps 2 through 4 in the *Connector Preparation* section (page 9) to insert a connector in the installation tool, carefully insert the cleaved fiber into the lead-in tube until you feel it firmly stop against the connector's fiber stub.



**Figure 17. Insert the Fiber into the Connector.**

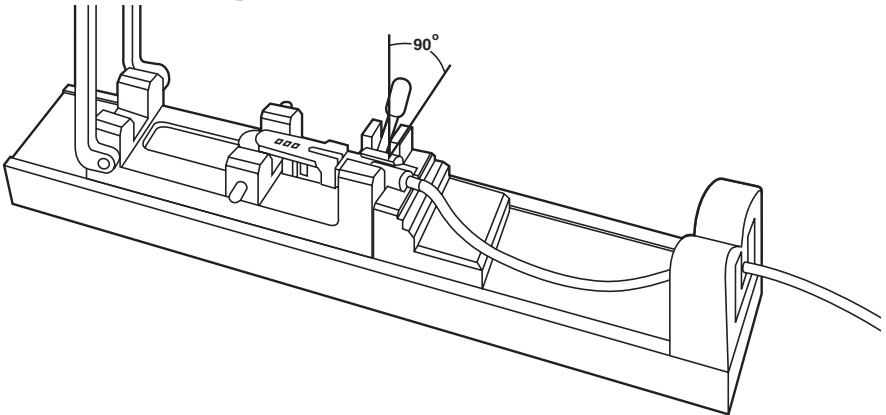
- 3) Guide the fiber straight in. Do not bend or angle it.
- 4) If you feel resistance at the entry funnel, rotate the fiber back and forth while applying a gentle inward pressure.

### NOTE

**If you have stripped and cleaved the fiber to the correct lengths, the end of the cable jacket or the buffer mark should be within 2 mm (0.08 in.) of the lead-in tube.**

**For jacketed fibers, there must be a gap between the jacket and the lead-in tube to assure that the fibers butt together. If you don't see a gap, pull the connector off the fiber and start over again with a new 40-mm length of bare fiber.**

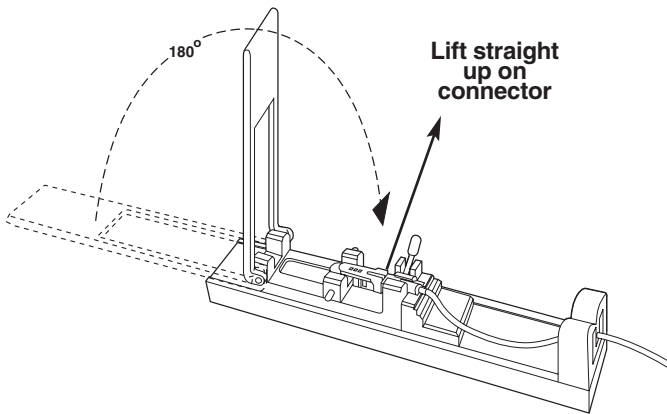
- 5) Apply a light inward pressure on the fiber to keep it butted against the fiber stub during the next step.
- 6) When installing a 250- $\mu\text{m}$  Fan-Out Cable or a 900- $\mu\text{m}$  fiber, carefully push the buffer into the fiber clamp on the tool. Maintain inward pressure on the fiber so that a slight bow forms in the buffered fiber between the connector and the clamp. This bow is important. It will help the fibers butt in the connector during the next step. When installing a 3-mm fiber, it is only necessary to hold the fiber in place by hand to apply a light inward pressure during step 7.
- 7) Rotate the wrench past 90° to cam the connector.



**Figure 18. Rotate the Wrench.**

## FIBER CONNECTOR TOOL KIT

- 8) The fiber is now held inside the connector by the splice. You no longer need to hold it in place, but be careful not to pull on the fiber.
- 9) Carefully flip the crimp handle 180° until it contacts the crimp tube. Push down firmly to crimp. You should see a flat impression in the crimp tube, indicating a proper crimp. The tool cannot over-crimp the connector.
- 10) Flip the crimp handle back. Leave the wrench handle down. Remove the connector by lifting it straight up and out of the tool. Do not pull on the fiber. Handle the connector only.

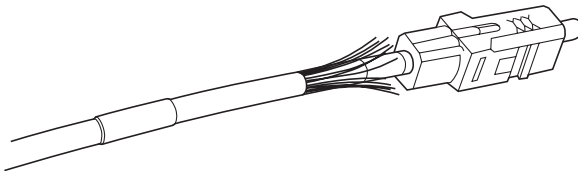


**Figure 19. Remove the Connector.**

*For 900- $\mu$ m and 250- $\mu$ m Fan-Out Installation: Go to Step 15.*

*3-mm Cable Only:*

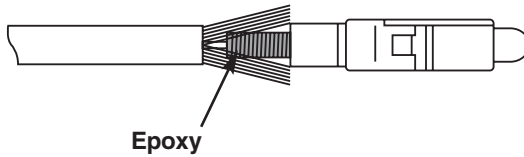
- 11) Hold the cable and slide the crimp ring back along the cable jacket to free the aramid yarn. Flare the yarn around the buffered fiber. The ends of the yarn should just touch the back of the square cam. If the yarn is too long, trim it now.



**Figure 20. Flare Aramid Yarn.**

Option: For added strain relief,

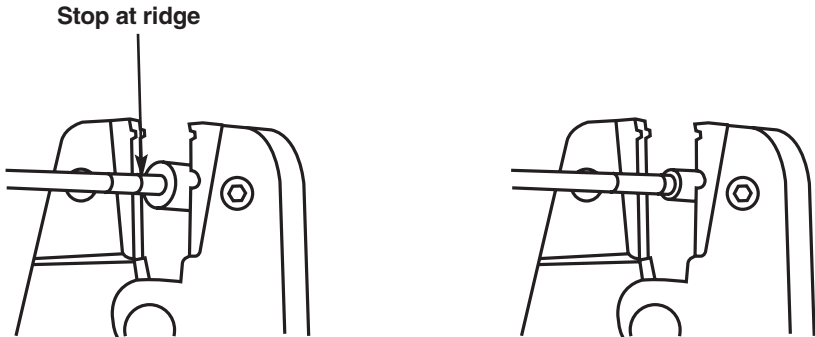
- Mix a small amount of Hysol® 0151 epoxy.
- Use a toothpick to apply a thin film of epoxy around the rear of the connector housing.
- You may substitute Loctite® 411 adhesive for the epoxy.



**Figure 21. Added Strain Relief.**

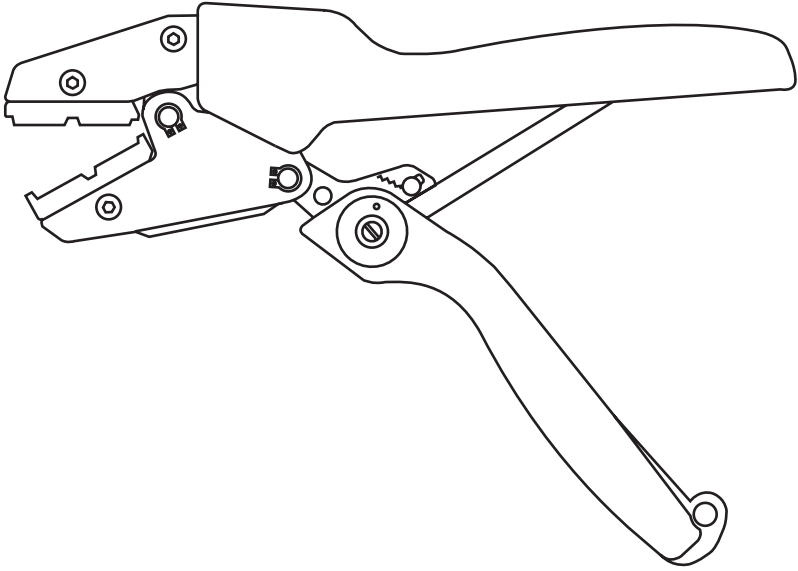
12) Hold the connector and push the crimp ring over the aramid yarn and against the back of the connector's cam.

13) Place the connector in the opening of the crimp tool jaws.



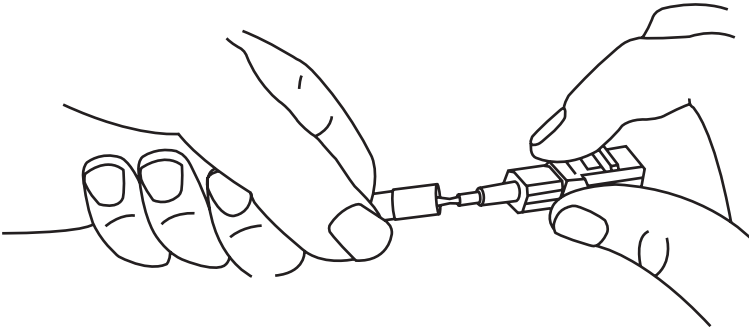
**Figure 22. Crimp Ring Position.**

14) Squeeze the handles shut to crimp the crimp ring onto the connector. Remove the connector and cable from the tool.



**Figure 23. Crimp Tool.**

15) Slide the boot up the back of the connector until it reaches the cam.



16) A small line of Loctite 411 adhesive may be applied around the rear of the connector, just past the metal crimp tube, before putting the boot on. Slide the boot into place quickly.

## NOTE

**Do not hesitate or the adhesive will cure before the boot is fully seated. A small bead of adhesive may be applied around the boot where the fiber enters. The boot must be in place before continuing.**

*SC Connector Only:*

17) The outer housing for a single-mode connector is blue. The multimode connector housing is beige. To install the Connector assembly in the SC outer housing, line up the date code on the inner shroud with the key on the outer housing. Using the boot, push the Connector assembly into the rear of the outer housing until it snaps into place. You may have to wiggle the parts to make them snap together.

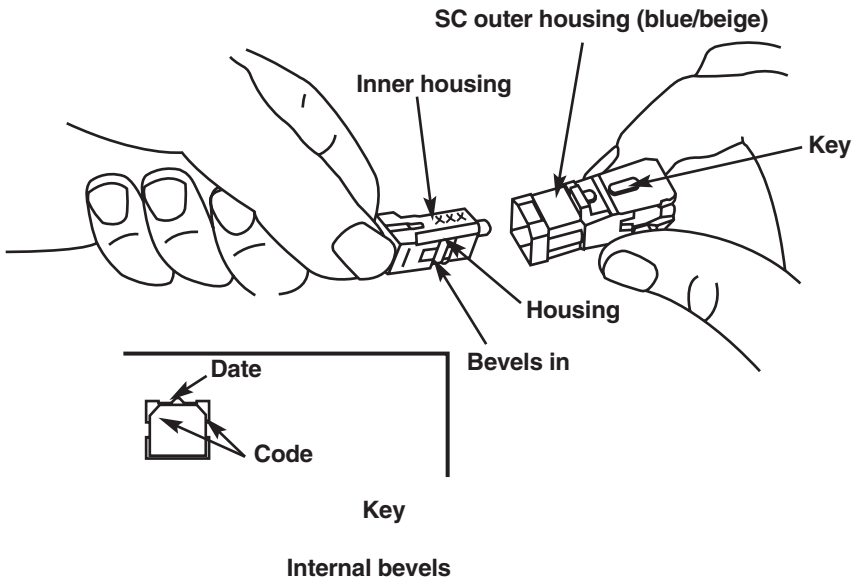


Figure 24. Snap on the SC Connector Housing.

18) The connector is now ready to use. Leave the front dust cap on until you are ready to insert the Pre-Polished Fiber Connector into a sleeve.

### Testing the Pre-Polished Fiber Connectors

We recommend that you test fiberoptic connectors according to EIA FOTP-171.

### Connector Maintenance

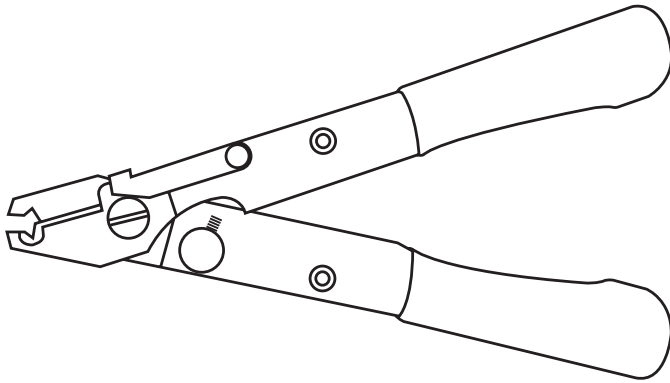
Always keep a clean dust cap on any connector which is not in use. Do not remove the dust cap until immediately before inserting the connector into a sleeve.

To clean the Connector:

- Wipe the end face and ferrule surfaces of the connector with an alcohol wipe.
- Wipe the end surface of the connector with a dry lint-free tissue. Make sure that the cloth makes full contact with the end face surface.
- Hold the nozzle of an ozone-safe aerosol duster 1.25 cm (0.5 in.) away from the connector and dust off the end surfaces of the connector.



### 3. Fiber Stripping Tool



This chapter describes how to strip fiber coating. The Stripping Tool has been factory adjusted to strip the 250- $\mu\text{m}$  (0.10-inch) diameter strippable fiber coating from 125- $\mu\text{m}$  (0.005-inch) diameter fibers. This tool is *not* designed for 900- $\mu\text{m}$  (0.35-inch) diameter coated fibers.

#### **WARNING!**

**When handling chemicals or cutting fiber, always wear safety glasses to protect your eyes from accidental injury. Pieces of glass fiber are very sharp and can damage the cornea of the eye easily.**

#### **WARNING!**

**Cleaved glass fibers are sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area where they can cause injury later. Use tweezers to pick up cut or broken pieces of the glass fibers and place them on a loop of tape kept for that purpose alone.**

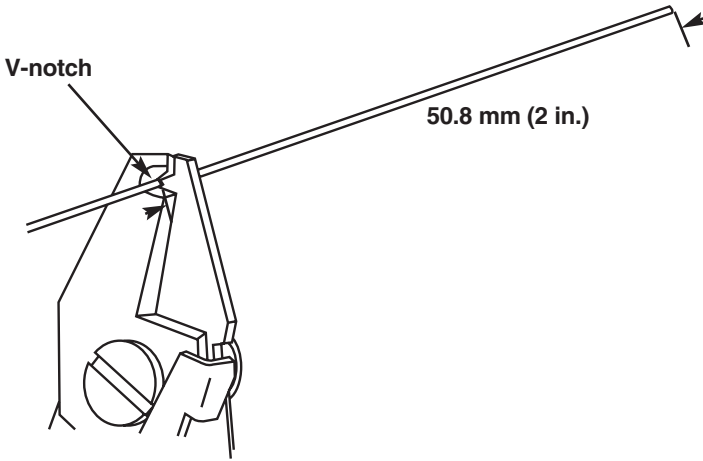
#### **CAUTION**

**Fiberoptic cable is sensitive to excessive pulling, bending, and crushing forces. Consult the cable specification sheet for the cable you are installing. Do not bend cable more sharply than the minimum recommended bend radius. Do not apply excessive pulling force to the cable or allow it to kink. Doing so may cause damage that can alter the transmission characteristics of the cable, and the cable may have to be replaced.**

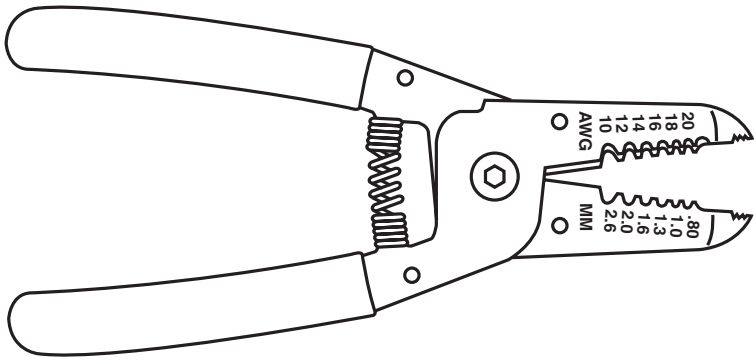
## FIBER CONNECTOR TOOL KIT

For the most consistent results when stripping the fiber coating:

- a) Hold the tool perpendicular to the fiber.
- b) Make sure the fiber is in the V-notch (see the illustration below).
- c) Slowly squeeze the tool shut.
- d) Strip the fiber coating in 50.8-mm (2-inch) increments with a smooth, straight pull.
- e) Gently wipe the fiber with an alcohol-soaked, lint-free tissue or wipe to remove any remaining residue.



## 4. Plier-Type Buffer Tube Stripper



This chapter describes how to score semi-rigid buffer tubes and how to cut outer jacketing on tight buffered pigtails and furcation tubing. The Buffer Tube Stripper is a plier-type wire stripper. The notches in the tool's jaws are marked with both AWG (American Wire Gauge) and metric hole sizes.

### WARNING!

**When handling chemicals or cutting fiber, always wear safety glasses to protect your eyes from accidental injury. Pieces of glass fiber are very sharp and can damage the cornea of the eye easily.**

### WARNING!

**Cleaved glass fibers are sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area where they can cause injury later. Use tweezers to pick up cut or broken pieces of the glass fibers and place them on a loop of tape kept for that purpose alone.**

### CAUTION

**Fiberoptic cable is sensitive to excessive pulling, bending, and crushing forces. Consult the cable specification sheet for the cable you are installing. Do not bend cable more sharply than the minimum recommended bend radius. Do not apply excessive pulling force to the cable or allow it to kink. Doing so may cause damage that can alter the transmission characteristics of the cable, and the cable may have to be replaced.**

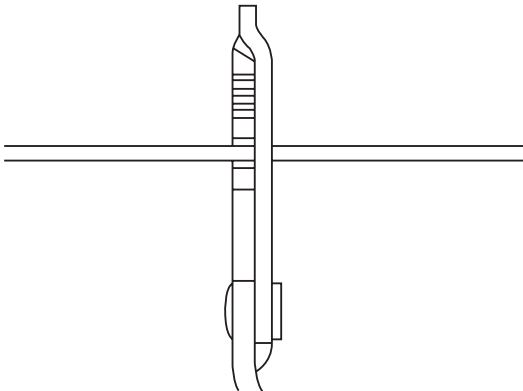
## IMPORTANT!

When using this tool to strip buffers, do *not* attempt to slide severed tubing or jacketing off the fibers with the sliding motion commonly used to strip copper wire with this type of tool. Doing so may break the fibers.

1) Select the correct size notch, for the buffer you are stripping, from the table below. *Italicized* items are semi-rigid buffer tubes.

Buffer Type	AWG Size
250- $\mu$ m furcation tubing Pigtail material 2-fiber Zipcord Fan-out cable	16
900- $\mu$ m furcation tubing 12-fiber buffer tube	14
DIB cable sheath Maxi-Bundle cable tube	10
6-fiber buffer tube	18
Micro-Bundle tube	20

2) Close the tool over the buffer. For consistent results, hold the tool perpendicular to the buffer.



3) Select the appropriate steps below for the buffer you are stripping. Remember, semi-rigid buffer tubes are the ones in italics in the table on the previous page.

### **Pigtails and Furcation Tubing**

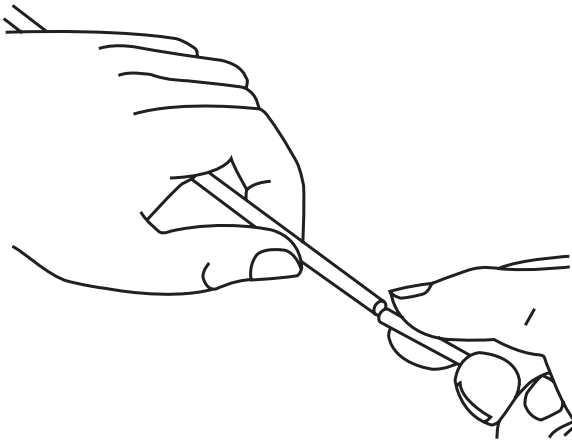
Squeeze the tool shut to cut the outer jacketing. If the material is not cleanly cut with the first effort, rotate the tool slightly and complete the cut. Remove the tool and carefully slide the jacketing off the yarn by hand.

### **Semi-Rigid Buffer Tubes**

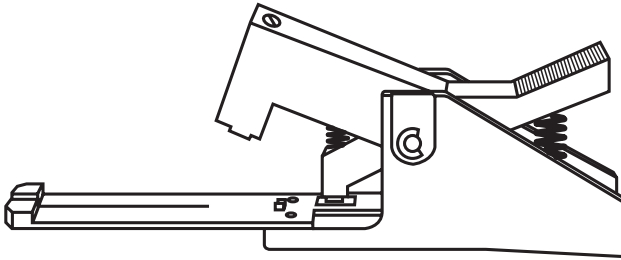
**NOTE:** We recommend buffer scoring and removal at a maximum interval of 10 inches (25 cm). Repeat the steps below as needed to remove the required length of buffer material.

Squeeze the tool shut. Release pressure on the handles and make a slight rotation of the tool. Squeeze the tool shut again to score the tube. Do not attempt to completely sever the tube with the tool.

Remove the tool. Apply gentle pressure to snap the scored section of the tube (see the illustration below). Carefully slide the severed section of tube off the fibers.



## 5. Fiber Cleaver



The Fiber Cleaver uses the score-and-snap method to quickly provide good-quality fiber cleaves for fusion or mechanical splicing.

We assume that you have stripped and cleaned the fiber to be cleaved according to the appropriate fiber shipping procedure.

### **WARNING!**

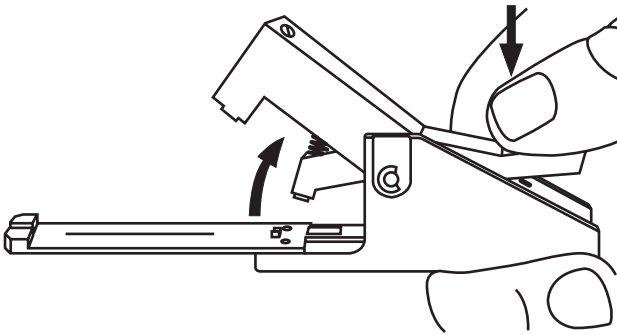
**When handling chemicals, cutting fiber, or using compressed air to clean equipment, always wear safety glasses to protect your eyes from accidental injury. Pieces of glass fiber are very sharp and can damage the cornea of the eye easily.**

### **WARNING!**

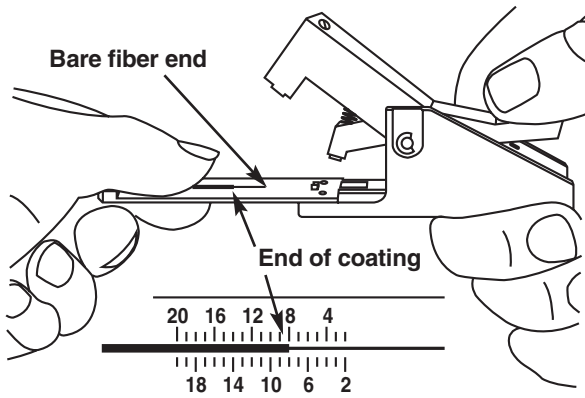
**Cleaved glass fibers are sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area where they can cause injury later. Use tweezers to pick up cut or broken pieces of the glass fibers and place them on a loop of tape kept for that purpose alone.**

In addition to the Fiber Cleaver, you'll need vinyl tape and tweezers.

1) Press down on the handle to open the cleaver's fiber clamp.

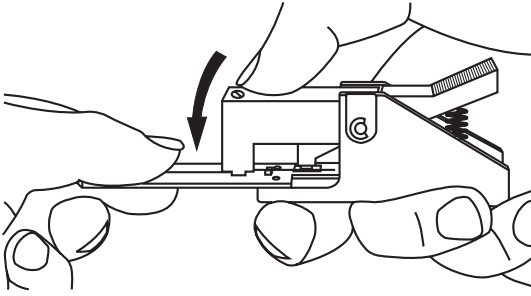


2) With your other hand, place the fiber in the cleaver's fiber guide so that the end of the fiber is under the fiber clamp and the end of the fiber coating lines up with the desired cleave length marking. *Do not flex the fiber guide at this time.*

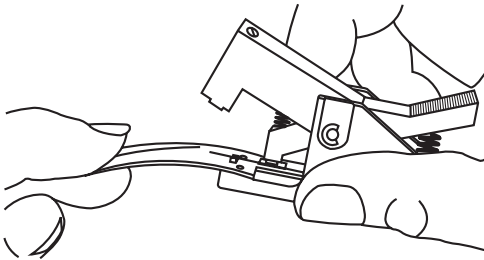


## FIBER CONNECTOR TOOL KIT

- 3) Gently release the handle to lower the clamp onto the bare fiber.
- 4) Press down the cleaver arm until it just touches the fiber and guide. This will apply enough pressure to properly score the fiber.

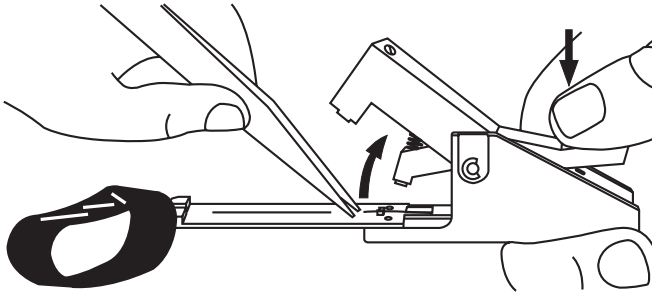


- 5) Gently release the cleaver arm.
- 6) Flex the fiber guide to snap the fiber (see the illustration below). The fiber is now ready for splicing.





7) Press down on the cleaver's handle to once again lift the fiber clamp. Remove the end piece of fiber with tweezers and place the fiber on a loop of tape for proper disposal.



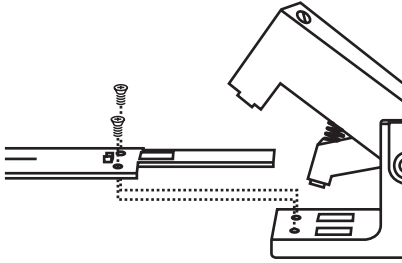
### Maintenance

Thoroughly clean the cleaver after each use. Small fiber remnants left in the cleaver may cause damage to parts during later use.

Periodically clean the cleaver's blade, fiber guide, and fiber clamp with an alcohol-soaked wipe, followed by a cleaning with compressed air. *Always wear safety glasses when cleaning with compressed air.*

### Guide Replacement

To replace the fiber guide, you will need a new guide and a small Phillips head screwdriver. Refer to the illustration on the next page when replacing the guide.



To replace the fiber guide:

- 1) Use the screwdriver to remove the two screws located in front of the fiber clamp.
- 2) Press the handle to open the clamp, and remove the old guide.
- 3) Place the new guide under the clamp; be careful to line up the screw holes.
- 4) Release the fiber clamp. Reinsert the screws and tighten. *Do not overtighten the screws.*

## 6. No-Nik<sup>®</sup> 200- $\mu$ m Tool



This chapter describes how to strip fiber coating. In addition to the No-Nik 200- $\mu$ m tool, we recommend also using 15- $\mu$ m abrasive disks (call your supplier if you need more information about the disks).

### **WARNING!**

**When handling chemicals or cutting fiber, always wear safety glasses to protect your eyes from accidental injury. Pieces of glass fiber are very sharp and can damage the cornea of the eye easily.**

### **WARNING!**

**Cleaved glass fibers are sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area where they can cause injury later. Use tweezers to pick up cut or broken pieces of the glass fibers and place them on a loop of tape kept for that purpose alone.**

### **CAUTION**

**Fiberoptic cable is sensitive to excessive pulling, bending, and crushing forces. Consult the cable specification sheet for the cable you are installing. Do not bend cable more sharply than the minimum recommended bend radius. Do not apply excessive pulling force to the cable or allow it to kink. Doing so may cause damage that can alter the transmission characteristics of the cable, and the cable may have to be replaced.**

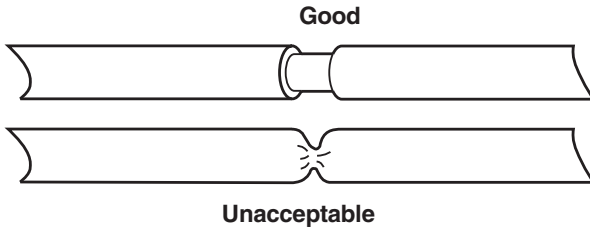
## FIBER CONNECTOR TOOL KIT

Before using the tool, open it up and make sure that the blades are clean and free from any coating fragments that might prevent the tool from making a clean cut.

If necessary, clean the tool with compressed air.

Check the tool's blades on a piece of scrap fiber to make sure that the tool is sharp enough to make a clean cut through the coating. To do so:

1. Place the fiber in the V-grooves of the tool and squeeze the handles.
2. Release the fiber from the tool without moving the tool down the fiber.
3. Check the cut with a magnifier. The cut should be clean and complete (see the illustration below). If the tool is not sharp enough to make a clean cut, replace it with a new one.



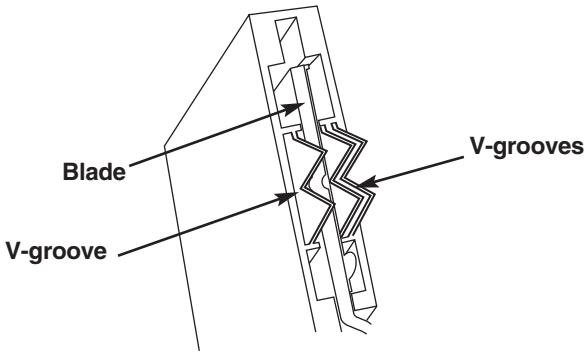
To strip a fiber:

- a) Grasp the buffered fiber between the thumb and forefinger of your left hand.

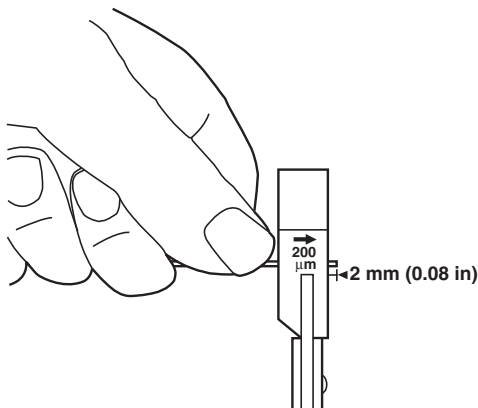
**NOTE:** With some cables, it will be necessary to restrain the buffer from pulling out of the cable during stripping. We recommend using a small piece of 15- $\mu\text{m}$  abrasive to grasp the buffer.

b) Hold the No-Nik tool in your right hand so that the directional arrow is visible and pointing to the right.

c) Open the tool with its handles. Note the actual location of the blades in the blade housing (see the illustration below).



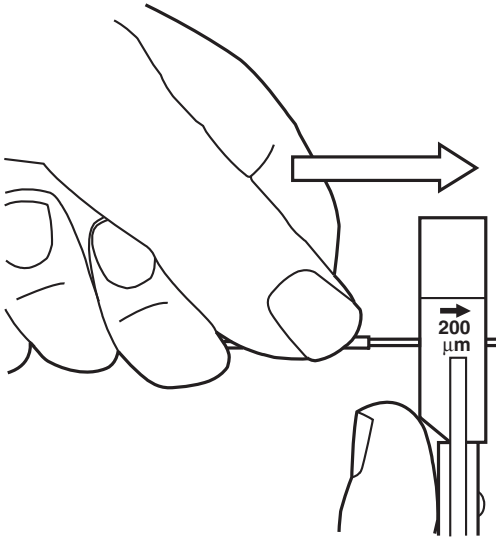
d) Place the fiber in the V-grooves in the blade housing so that no more than 2 mm (0.08 in.) of coated fiber extends beyond the housing (see the illustration below). This positioning will provide a total strip length of 6 mm (0.25 in.).



e) Clamp down on the fiber and make the cut in the buffer by squeezing the No-Nik tool handles together. Pause briefly to allow the coating to pull away from the fiber.

## FIBER CONNECTOR TOOL KIT

f) Place your right thumb along the left side of the tool. Push the No-Nik tool along the fiber axis in a smooth, straight stroke to slide the severed piece of coating off of the fiber.



To strip lengths of fiber greater than 6 mm, repeat the steps in this chapter, removing additional 6-mm lengths until the desired length of glass fiber has been exposed.

# 7. Safety Data: Isopropyl Alcohol

## Identity

*Product Name:* Isopropyl Alcohol (Code 118)  
*Chemical Name:* Isopropanol; 2-Propanol  
*Product Class:* Isopropanol

## Hazardous Ingredients

% By Weight	Material Description	CAS Registry #	ACGIH TLV	OSHA PEL	Vapor Pres. mm Hg @ 20C
100	Isopropanol	67-63-0	400 ppm	400 ppm	37.00

## Typical Physical and Chemical Data, Not Specifications

VOCs ( $\pm 2\%$ ): 100% by wt.; 100% by vol.  
 Solids ( $\pm 2\%$ ): 0% by wt.; 0% by vol.  
 Water/Expt VOCs ( $\pm 2\%$ ): 0% by wt.; 0% by vol.  
 Approximate Product Weight (lb./gal.): 6.6  
 Appearance/Odor: Liquid with a characteristic odor  
 Boiling Range (Degrees Fahrenheit): 180 to 180  
 Evaporation Rate (Ether = 1): <1  
 Vapor Density (Air = 1): >1  
 Solubility in Water: Complete

## Fire and Explosion Data

*Flash Point (Degrees Fahrenheit):* Below 73

*Extinguishing Media:* Foam, alcohol-type foam, carbon dioxide, dry chemical, water

*Special Firefighting Procedures:* Wear self-contained breathing apparatus with a full faceplate operated in pressure-demand or other positive pressure mode.

*Unusual Fire and Explosion Hazards:* Material is volatile. Vapors are heavier than air and may travel along the ground or may be moved by ventilation and ignited by flames, sparks, heaters, smoking, electrical motors, static discharge, or other ignition sources at locations distant from material handling point.

## Physical Hazards

*Stability:* Stable under normal conditions. Keep away from heat, sparks, and open flame.

*Incompatibility:* Strong oxidizing materials.

*Hazardous Decomposition Products:* Carbon monoxide and carbon dioxide.

*Hazardous Polymerization:* Will not occur. No known conditions to avoid.

## Health and Safety

*Acute Health Hazard:* Eye, skin, and respiratory system irritation; depression, headache, dizziness, mental confusion, nausea, vomiting. Ingestion of isopropanol by laboratory animals causes fetal damage. The relevance of these findings to humans is uncertain. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal.

*Chronic Health Hazard:* Reports have associated repeated and prolonged overexposure to organic solvents with permanent brain and nervous system disease. No components are listed as being carcinogenic by the NTP, IARC, or OSHA.

*Eyes:* Use safety glasses or goggles as needed to prevent direct contact. In case of contact, immediately flush eyes with large amounts of water and continue for at least fifteen minutes. Get medical attention if irritation persists.

*Skin:* Use impermeable gloves and aprons as needed to prevent direct contact. In case of contact, remove contaminated clothing and shoes; wash skin with soap and water. Get medical attention if irritation persists.

*Respiratory System:* Use a NIOSH-approved respirator for organic mists or vapors in areas where airborne concentration exceeds the listed TLV(s). In case of overexposure, remove victim to fresh air and treat symptomatically. Get medical attention if breathing difficulties persist.

*Ingestion:* (Seek emergency medical attention!) If victim is conscious, give one or two glasses of water to dilute ingested material.

*Other Protective Equipment:* Eye bath, safety shower (as needed, depending on use).



## **Spill and Disposal Procedures and Special Precautions**

*Steps for Material Spillage:* Evacuate unnecessary personnel. Eliminate all sources of ignition. Soak up small spills with absorbent material. Dike large spills to prevent runoff, recover as much liquid as possible, soak up remaining liquid with absorbent material.

*Waste Disposal Method:* In accordance with local, state, and federal regulations.

*Handling and Storage Precautions:* Store at ambient temperature in well-ventilated area away from sources of ignition. Keep container closed when not in use. Ground all containers when transferring material.

*Other Precautions:* “Empty” containers contain residue. Do not cut, puncture, or weld on empty container because it may contain explosive or harmful vapors. Follow label and MSDS warnings even after the package is emptied. Suggested HMIS Rating: H=2, F=3, R=0

## 8. Safety Data: 411 Adhesive

### Identity

*Product Name:* Prism® 411 Clear Toughened Inst. Adhesive  
*Product Type:* Cyanoacrylate Ester  
*Formula No.:* FMD-01

### Composition

<u>Ingredients</u>	<u>CAS No.</u>	<u>%</u>
Ethyl cyanoacrylate	7085-85-0	85-90
Poly (methyl methacrylate)	9011-14-7	10-15
Silica, Amorphous Treated	112945-52-5	1-3
Phthalic Anhydride*	85-44-9	0.1-1
Hydroquinone	123-31-9	0.1-0.5

\*This component is listed as a SARA Section 313 Toxic Chemical.

### Chemical and Physical Properties

Vapor Pressure:	Less than 0.2 mm at 75°F
Vapor Density:	Approximately 3
Solubility in Water:	Polymerized
Specific Gravity:	1.05 at 75°F
Boiling Point:	More than 300°F
Volatile Organic Compound (EPA Method 24):	85.6%
Evaporation Rate (Ether = 1)	Not available
pH:	Not applicable
Appearance:	Clear liquid
Odor:	Sharp, irritating

**Flammability and Explosive Properties**

Flash Point:	150 to 200°F
Method:	Tag Closed Cup
Estimated NFPA Code	
Health Hazard:	2
Fire Hazard:	2
Reactivity Hazard:	2
Specific Hazard:	No water
Estimated HMIS Code	
Health Hazard:	2
Flammability Hazard:	2
Reactivity Hazard:	2
Personal Protection:	See <i>Personal Protection</i> section.
Explosive Limits	
(% by volume in air) Lower:	1.7% Phthalic anhydride
(% by volume in air) Upper:	10.5% Phthalic anhydride
Extinguishing Agents:	Carbon dioxide, Foam, Dry Chemical
Hazardous Products Formed by Fire or Thermal Decomp:	Irritating organic vapors
Unusual Fire or Explosion Hazards:	None
Compressed Gases:	None
Pressure at Room Temperature:	Does not apply

**Spill or Leak and Disposal Procedures**

Steps to Take in Case of Spill or Leak:	Flood with water to polymerize. Soak up with an inert absorbent.
Recommended Methods of Disposal:	Polymerize as above. Incinerate in accordance with EPA and local regulations.

**Storage and Handling Procedures**

Storage:	Store at or below 75°F to maximize shelf life.
Handling:	Avoid contact with skin and eyes. Avoid breathing vapor.

## Shipping Regulations

DOT (49 CFR 172)

Domestic Ground Transport

Proper Shipping Name:

Unrestricted (Not more than 450 liters);  
Combustible liquids, n.o.s.  
(Cyanoacrylate ester)  
(More than 450 liters)

Hazard Class or Division:

Unrestricted (Not more than 450 liters)  
Combustible liquid (More than  
450 liters)

Identification Number:

None (Not more than 450 liters);  
NA 1993 (More than 450 liters)

Marine Pollutant:

None

IATA

Proper Shipping Name:

Unrestricted (Not more than one pint);  
Other regulated substances  
(More than one pint)

Class or Division:

Unrestricted (Not more than one pint);  
Class 9 (More than one pint)

UN or ID Number:

None (Not more than one pint)  
ID 8027 (More than one pint)

## Reactivity Data

Stability:

Stable

Hazardous Polymerization:

Will not occur

Hazardous Decomposition

Products (non-thermal):

None

Incompatibility:

Polymerized by contact with water,  
alcohols, amines, alkalis

## Emergency Treatment Procedures

Ingestion: Ingestion is not likely. See the *First Aid* section.

Inhalation: Remove to fresh air. If symptoms persist, obtain medical attention.

Skin Contact: Soak in warm water. See the *First Aid* section.

Eye Contact: Flush with water. See the *First Aid* section.

## Personal Protection

- Eyes: Safety glasses or goggles recommended.
- Skin: Nitrile or polyethylene gloves and aprons. Do not use cotton. See the *First Aid* section.
- Ventilation: Positive down-draft exhaust ventilation should be provided to maintain vapor concentration below TLV.

## Health Hazard Data

- Toxicity: Skin contact may cause burns. Bonds skin rapidly and strongly. Skin and eye irritant. Estimated oral LD50 more than 5000 mg/kg. Estimated dermal LD50 more than 2000 mg/kg.
- Primary Routes of Entry: None known
- Signs & Symptoms of Exposure: Vapor is irritating to eyes and mucous membranes above TLV. Prolonged and repeated overexposure to vapors may produce allergic reactions with asthma-like symptoms in sensitive individuals.
- Existing Conditions Aggravated by Exposure: None known.

### Exposure Limits (TWA):

Ingredients	ACGIH (TLV)	OSHA (PEL)	OTHER
Ethyl cyanoacrylate	None	None	2 ppm TWA
Silica, Amorphous Treated	10 mg/m <sup>3</sup> TWA	6 mg/m <sup>3</sup> TWA	None
Phtalic Anhydride	1 ppm TWA 6.1 mg/m <sup>3</sup>	1 ppm TWA 6 mg/m <sup>3</sup>	None
Hydroquinone	2 mg/m <sup>3</sup> TWA	2 mg/m <sup>3</sup> TWA	2 mg/m <sup>3</sup> TWA 4 mg/m <sup>3</sup> STEL

### Exposure Limits (STEL):

Ingredients	ACGIH (TLV)	OSHA (PEL)
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Ingredients for which no Exposure Limits have been established are not listed above.

# FIBER CONNECTOR TOOL KIT

<u>Ingredients</u>	<u>Literature Referenced Target Organ and Other Health Effects</u>	<u>Carcinogen</u>		
		<u>NTP</u>	<u>IARC</u>	<u>OSHA</u>
Ethyl cyanoacrylate	LUN SKI	No	No	No
Poly (methyl methacrylate)	No Data	No	N/A	No
Silica, Amorphous Treated	LUN	No	N/A	No
Phthalic Anhydride	IRR MET REP	No	No	No
Hydroquinone	BLO IRR LIV MUT NER REP	No	N/A	No

## Abbreviations

N/A	Not Applicable	BLO	Blood
IRR	Irritant	LIV	Liver
LUN	Lung	MET	Metabolic
MUT	Mutagen	NER	Nervous System
REP	Reproductive	SKI	Skin

## First Aid

Cyanoacrylate adhesive is a very fast setting and strong adhesive. It bonds human tissue including skin in seconds. Experience has shown that accidents due to cyanoacrylates are handled best by passive, nonsurgical first aid. Treatment of specific types of accidents are given below.

### Skin Contact

Remove excess adhesive. Soak in warm, soapy water. The adhesive will come loose from the skin in several hours. Cured adhesive does not present a health hazard even when bonded to the skin.

Avoid contact with clothes, fabrics, rags, or tissue. Contact with these materials may cause polymerization. The polymerization of large amounts of adhesive will generate heat causing smoke, skin burns, and strong, irritating vapors. Wear nitrile or polyethylene gloves and apron when handling large amounts of adhesive.

### Skin Adhesion

First immerse the bonded surfaces in warm, soapy water. Peel or roll the surfaces apart with the aid of a blunt edge (a spatula or a teaspoon handle, for example); then remove adhesive from the skin with soap and water. Do not try to pull surfaces apart with a direct opposing action.

**Eyelid to Eyelid or Eyeball Adhesion**

In the event that eyelids are stuck together or bonded to the eyeball, wash thoroughly with warm water and apply a gauze patch. The eye will open without further action, typically in one to four days. There will be no residual damage. Do not try to open the eyes by manipulation.

**Adhesive on the Eyeball**

Cyanoacrylate introduced into the eyes will attach itself to the eye protein and will disassociate from it over intermittent periods, generally covering several hours. This will cause periods of weeping until clearance is achieved. During the period of contamination, double vision may be experienced together with a lachrymatory effect, and it is important to understand the cause and realize that disassociation will normally occur within a matter of hours, even with gross contamination.

**Mouth**

If lips are accidentally stuck together, apply lots of warm water to the lips and encourage maximum wetting and pressure from saliva inside the mouth. Peel or roll lips apart. Do not try to pull the lips with direct opposing action.

It is almost impossible to swallow cyanoacrylate. The adhesive solidifies and adheres in the mouth. Saliva will lift the adhesive in one half to two days. In case a lump forms in the mouth, position the patient to prevent ingestion of the lump when it detaches.

**Burns**

Cyanoacrylates give off heat on solidification. In rare cases a large drop will increase in temperature enough to cause a burn. Burns should be treated normally after the lump of cyanoacrylate is released from the tissue as described above.

**Surgery**

It should never be necessary to use such a drastic method to separate accidentally bonded skin.



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