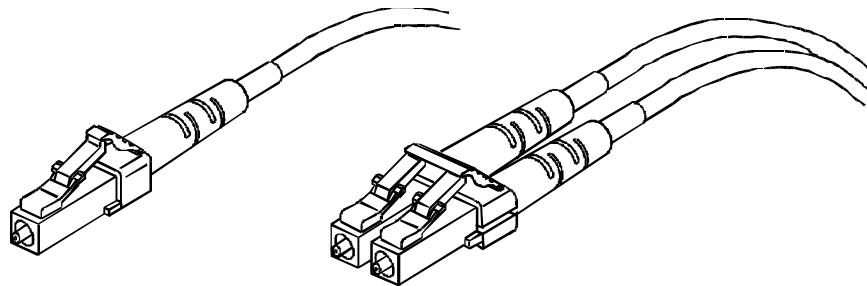


# Assembly Instructions for **LC™** Fiber Optic Jumper Connectors

Epoxy Method for Singlemode and Multimode **LC** Simplex  
and Duplex Jumper Connectors Used on Simplex and Duplex  
1.6-mm MiniCord™ Jumper Cords





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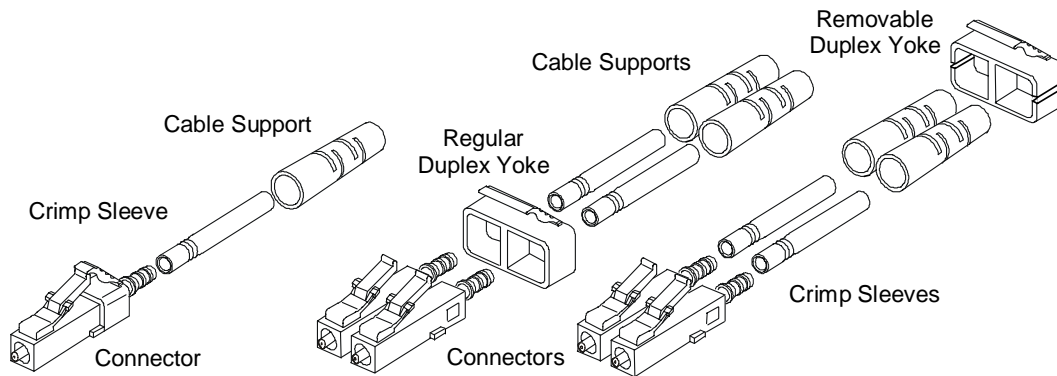
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# 1. General

## 1.1 LC™ Jumper Connectors

The **LC** Fiber Optic Simplex and Duplex Jumper Connectors can be used to terminate simplex and duplex 1.6-mm MiniCord™ jumper cords. It is intended for use in Central Offices, Local Area Networks (LANs), and in patch cords for Premises Distribution Systems such as SYSTIMAX® Structured Cabling Systems. The connector can also be used in computer backplane connections, computer peripheral interconnections, device terminations, and other applications where quality, small-size, high-density, low-loss, and a low-cost infrastructure are required.



Simplex Jumper Components\*

Duplex Jumper Components

\*Available one per package for simplex cord and two per package for SM duplex cord.

**Note:** In addition to the simplex and duplex **LC** jumper connectors for 1.6-mm MiniCord™ jumper cords, a Behind-The-Wall (BTW) connector is offered for 0.9-mm buffered fiber. Installation of the BTW connector is **not** covered in this customer information product (CIP). The BTW connector can be used to terminate Outside Plant (OSP) cables as well as building cables.

When installed on typical fiber, the following performance should be obtained:

Multimode  
 Insertion loss (avg.) = 0.1 dB  
 Return loss ≥ 30 dB

Singlemode  
 Insertion loss (avg.) = 0.2 dB  
 Return loss ≥ 50 dB

## 1.2 Epoxy Consumables

Kit Type (Note)	Kit Number	Comcode	Kit Includes
Multimode	D-182983	108 340 811	Polishing paper, epoxy, and other materials required to assemble 200 multimode connectors.
Singlemode	D-182977	108 338 591	Polishing paper, epoxy, and other materials required to assemble 200 singlemode connectors.

**Note:** Kits **do not** contain connectors, isopropyl alcohol, or nonozone-depleting canned air.

## 1.3 Epoxy Tool and Upgrade Kits

Kit Type (Note)	Kit Number	Comcode	Kit Includes
Epoxy Tool Kit	1032B5	106 705 213	110-volt curing oven
Epoxy Tool Kit	1032B6	106 919 012	220-volt curing oven

**Note:** In addition to the tool kit, the D-182959 Upgrade Kit (108 262 569) is also required.

## 1.4 Ordering Information

Section 11 contains ordering information for **LC** connectors and kits.

## 2. Safety Precautions

- Safety glasses should be worn at all times while performing the installation procedures.
- Avoid skin contact with the epoxy.
- Place combustibles away from the curing oven when it is in operation. After the oven has reached its operating temperature, the oven ports and heat tube assemblies are extremely hot [266°F (130°C)]. Allow the oven and heat tube assemblies to cool before handling or storing.
- Optical fibers may emit radiation if the far end is connected to a working laser or Light-Emitting Diode (LED). Never view the fiber end of a cable or plug with the naked eye or any optical instrument until absolute verification is established that the fiber is disconnected from any laser or LED source.

## 3. Oven Preparation

### 3.1 Set Up Curing Oven

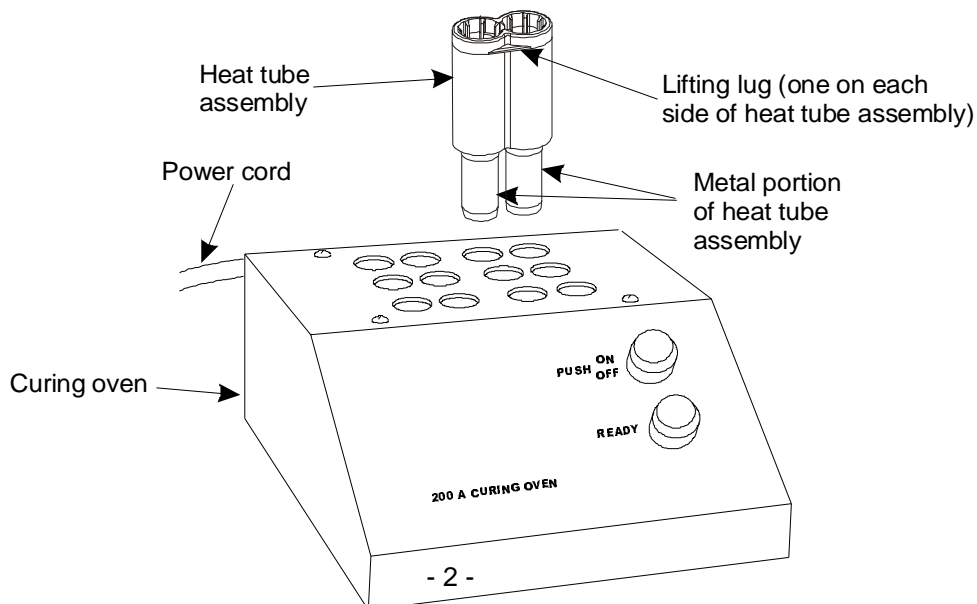
1. Place oven on a level surface and away from combustibles.
2. Connect the power cord to a power source (120 V 60 Hz AC for the 200A oven and 220 V 50 Hz AC for the 200AI international oven).
3. Locate the six heat tube assemblies (108 261 835) supplied with the D-182959 Upgrade Kit (108 262 569).
4. Insert the heat tube assemblies into the heater ports.

**Note:** Be certain that the metal portion of each heat tube assembly is fully inserted into the heater ports.

5. Push the **ON/OFF** switch to the **ON** position (lamp in switch illuminates).

**Note:** A **READY** lamp will illuminate when the oven reaches its operating temperature of **266°F (130°C)**.

**Caution:** After the oven reaches its operating temperature, the metal portion of the heat tube assembly will be extremely **HOT** [266°F (130°C)]. Allow the oven and heat tube assemblies to cool before handling and storing.

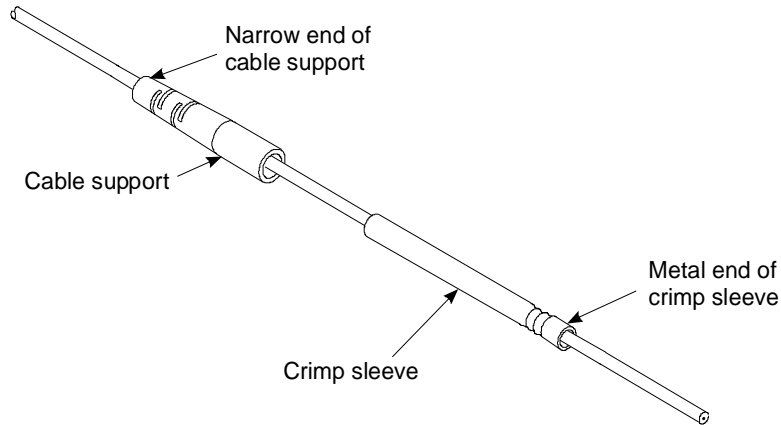


## 4. Cord Preparation

### 4.1 Assemble Connector Components

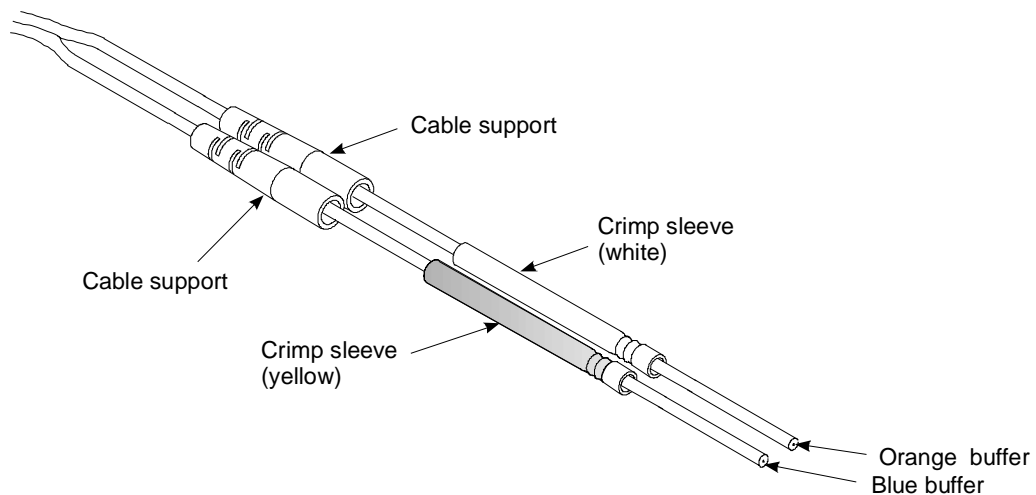
#### 4.1.1 Simplex Applications on a Simplex Cord

1. Thread a cable support onto the simplex cord, narrow end first.
2. Thread a crimp sleeve onto the cord. The metal end of the crimp sleeve should be oriented toward the end of the cord.
3. Repeat Steps 1 and 2 for the other end of the cord.



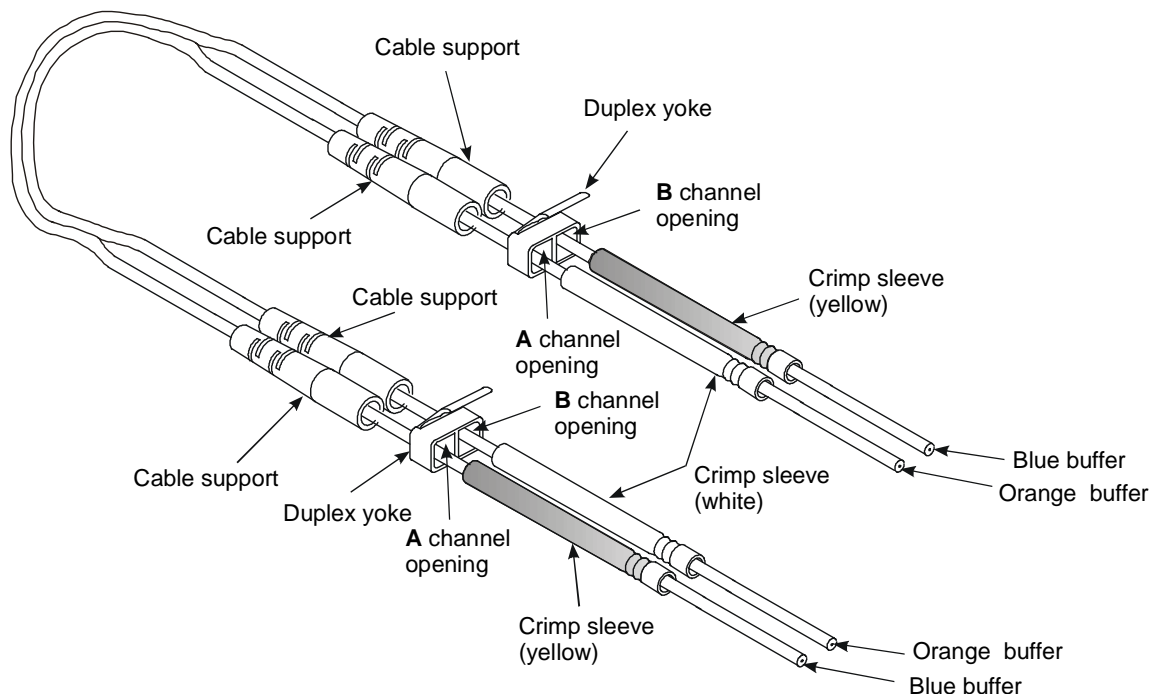
#### 4.1.2 Singlemode Simplex Applications on a Duplex Cord

1. Split the jacket on the duplex cord into two separate cords at least 9 inches (230 mm) from the end.
2. Thread a cable support onto each cord, narrow end first.
3. Determine the buffer color of each cord by looking into the end of the cordage. The duplex cord should have a blue buffer and an orange buffer.
4. Thread a yellow crimp sleeve on the cord with the blue buffer and a white crimp sleeve on the cord with the orange buffer. The metal end of the crimp sleeve should be oriented toward the end of the cord.
5. Repeat Steps 1 through 4 for the other end of the cord.



#### 4.1.3a Duplex Applications on a Duplex Cord (with Regular Duplex Yoke)

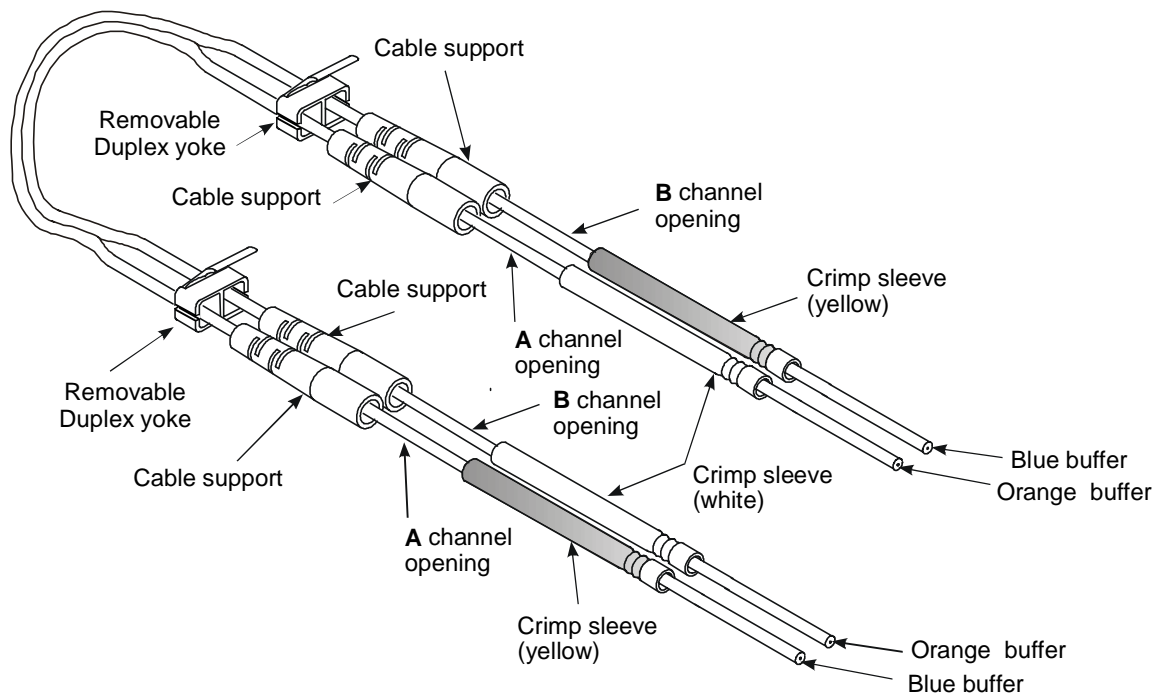
1. Split the jacket on the duplex cord into two separate cords at least 9 inches (230 mm) from the end.
2. Thread a cable support onto each cord, narrow end first.
3. Determine the buffer color of each cord by looking at the end of the cordage. The duplex cord should have a blue buffer and an orange buffer.
4. Locate the **B** channel opening on the duplex yoke.
5. At the first end, thread the cord with the blue buffer through the **B** channel opening.
6. Locate the **A** channel opening on the duplex yoke.
7. Thread the cord with the orange buffer through the **A** channel opening.
8. Place a yellow crimp sleeve on the cord with the blue buffer and a white crimp sleeve on the cord with the orange buffer. The metal end of the crimp sleeves should be oriented toward the end of the cord.
9. On the opposite end of the duplex cord, split the jacket into two separate cords at least 9 inches (230 mm) from the end.
10. Thread a cable support onto each cord, narrow end first.
11. Determine which cord has the blue buffer and which cord has the orange buffer.
12. Locate the **A** channel opening on the duplex yoke.
13. Thread the cord with the blue buffer through the **A** channel opening.
14. Locate the **B** channel opening on the duplex yoke.
15. Thread the cord with the orange buffer through the **B** channel opening.
16. Place a yellow crimp sleeve on the cord with the blue buffer and a white crimp sleeve on the cord with the orange buffer. The metal end of the crimp sleeves should be oriented toward the end of the cord.





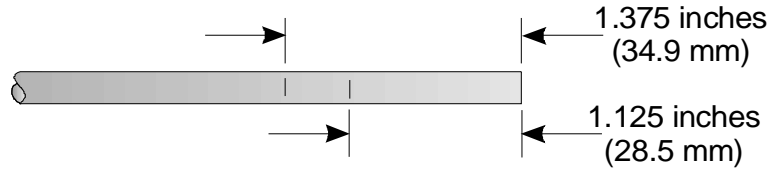
#### 4.1.3b Duplex Applications on a Duplex Cord (with Replaceable Duplex Yoke)

1. Split the jacket on the duplex cord into two separate cords at least 9 inches (230 mm) from the end.
2. Determine the buffer color of each cord by looking at the end of the cordage. The duplex cord should have a blue buffer and an orange buffer.
3. Locate the **B** channel opening on the duplex yoke.
4. At the first end, thread the cord with the blue buffer through the **B** channel opening.
5. Locate the **A** channel opening on the duplex yoke.
6. Thread the cord with the orange buffer through the **A** channel opening.
7. Thread a cable support onto each cord, narrow end first.
8. Place a yellow crimp sleeve on the cord with the blue buffer and a white crimp sleeve on the cord with the orange buffer. The metal end of the crimp sleeves should be oriented toward the end of the cord.
9. On the opposite end of the duplex cord, split the jacket into two separate cords at least 9 inches (230 mm) from the end.
10. Determine which cord has the blue buffer and which cord has the orange buffer.
11. Locate the **A** channel opening on the duplex yoke.
12. Thread the cord with the blue buffer through the **A** channel opening.
13. Locate the **B** channel opening on the duplex yoke.
14. Thread the cord with the orange buffer through the **B** channel opening.
15. Thread a cable support onto each cord, narrow end first.
16. Place a yellow crimp sleeve on the cord with the blue buffer and a white crimp sleeve on the cord with the orange buffer. The metal end of the crimp sleeves should be oriented toward the end of the cord.

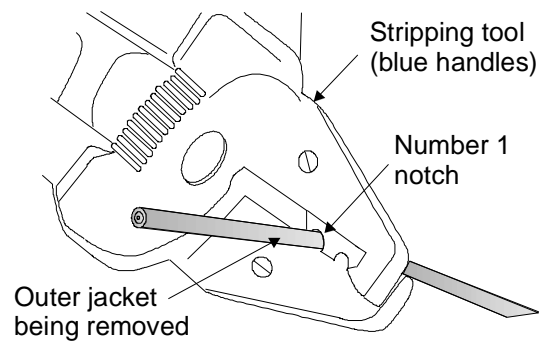


## 4.2 Remove Outer Jacket and Trim Strengthening Yarn

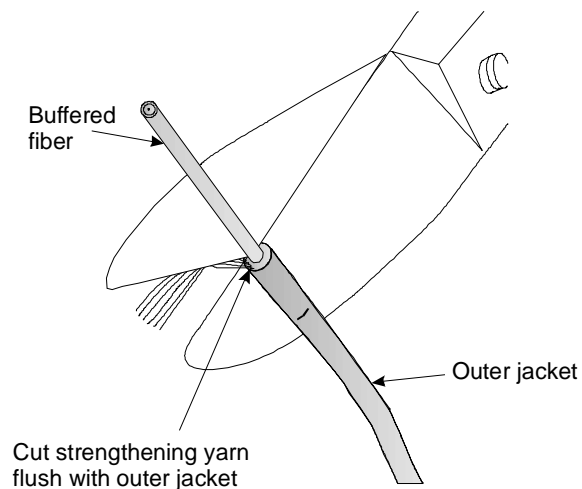
1. Locate the template and pen provided in the D-182959 Upgrade Kit (108 262 536).
2. Measure and mark outer jacket at 1.125 inches (28.5 mm) and at 1.375 inches (34.9 mm) from the end.



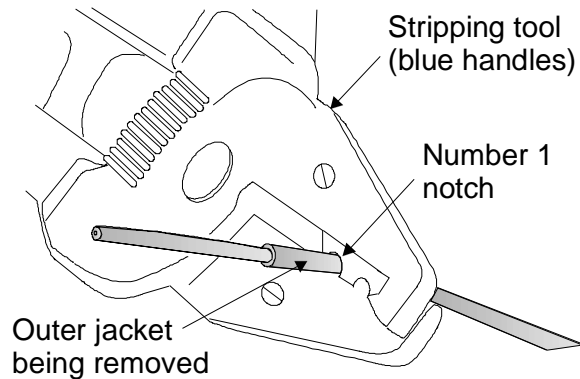
3. Use the 700A stripping tool to remove outer jacket at the 1.125 inches (28.5 mm) mark.



4. Lightly twist the strengthening yarn into one bundle and use scissors to cut yarn flush with the end of the outer jacket.



5. Use the 700A stripping tool to remove outer jacket at the 1.375 inches (34.9 mm) mark. This will expose 0.25 inch (6.3 mm) of yarn.



6. Flare the shortened strengthening yarn evenly around the cable. The brush from the 1026A stripper tool can be used.

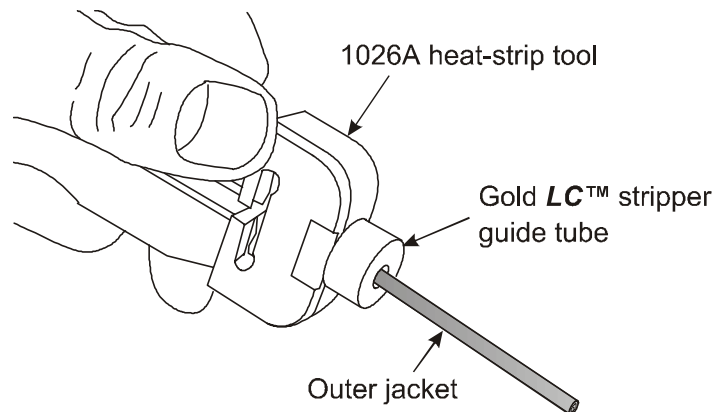
### 4.3 Remove Buffer and Fiber Coating

**Note:** Refer to 1026A Heat-Strip Tool operating instructions for heat-strip tool setup.

1. Locate the 1026A Heat-Strip Tool (105 514 764) provided in the 1032B5 Tool Kit (106 705 213) or in the 1032B6 Tool Kit (106 919 012).
2. Locate the gold **LC** stripper guide tube (108 262 577) provided in D-182959 Upgrade Kit.
3. Install the heat-strip tube into the heat-strip tool making sure the heat-strip tube is fully inserted into the heat-strip tool.
4. Insert buffered fiber into the guide tube until the jacket and strengthening yarn hit the appropriate stop inside the guide tube.

**Note:** Do not force the cord into the guide tube. If the buffer does not go through the guide tube easily, trim 0.03125 inch (0.794 mm) from end of buffer. The end of the buffer occasionally becomes flattened when the cord is initially cut. The buffered fiber should protrude approximately 0.55 inch (14 mm) into the guide tube.

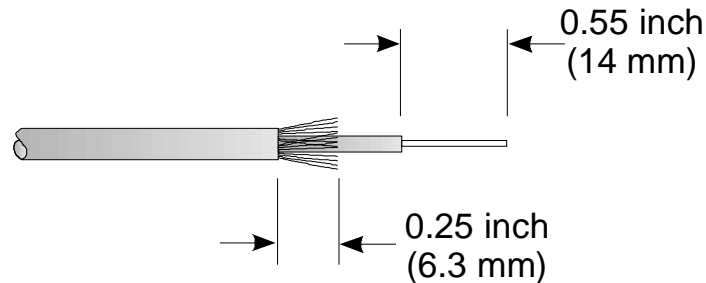
**Caution:** Proper stripping lengths and procedures are required for best connector pull-proof performance.



5. Close the handles of the heat-strip tool and wait 6 to 10 seconds for the softening of the buffer to occur.
6. Wrap the cord around your index finger and pull the fiber from the tool with one smooth and straight motion.

**Note:** Wrapping the cord around your index finger may prevent the buffered fiber from slipping out of the jacket during the stripping operation.

**Caution:** The buffer must not be allowed to move within the cord while stripping. Do not strip additional buffer length if buffer pulls from cordage. Buffer will normally push back into cord during connector plug assembly.

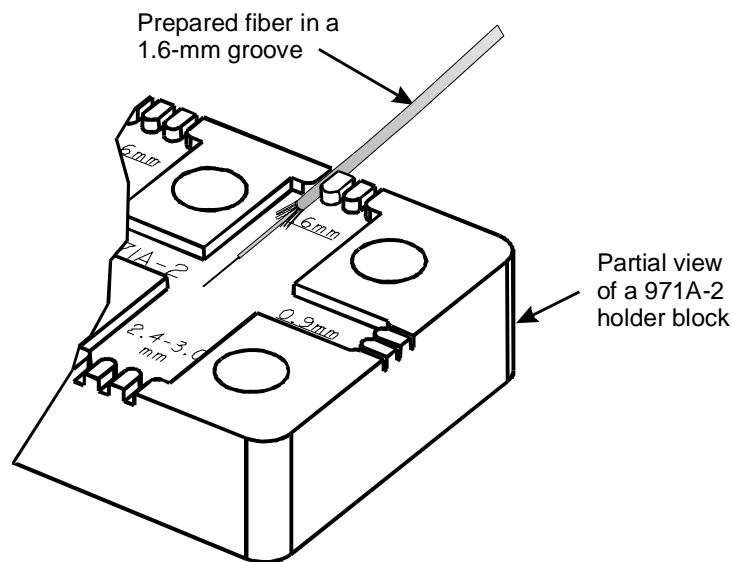


#### 4.4 Clean Stripped Fiber

1. Saturate a wipe with isopropyl alcohol (>91% 2-propanol + water).
2. Start at the coating end and wipe toward the fiber end.

**Note:** If residue remains on the fiber, use a clean wipe saturated with isopropyl alcohol to wipe the fiber again.

3. Place the prepared cord into the grooves of the 971A-2 holder block to avoid breaking or contamination of the fiber (holder blocks are provided in the D-182959 Upgrade Kit).



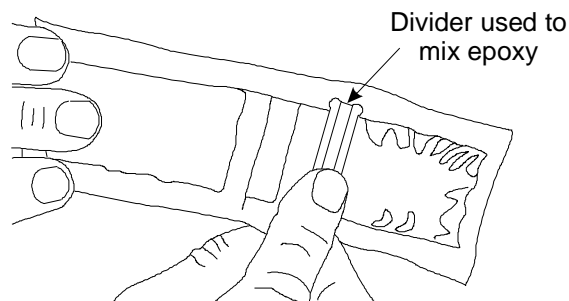
## 5. Epoxy Preparation

The supplied epoxy comes in a two-part package. A divider separates the resin from the hardener. The divider must be removed to allow the epoxy to be mixed. The epoxy is then loaded into a syringe. Both the epoxy package and the syringe are furnished with the D-182977 (108 338 591) and the D-182983 (108 340 811) Kits of Consumables. See ordering information in Section 10 of this manual.

**Caution:** Avoid contact of epoxy with skin.

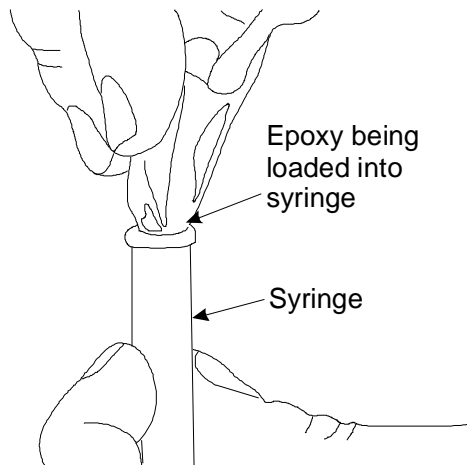
1. Locate the epoxy package in the D-182977 or the D-182983 consumables kits..
2. Remove the divider between the resin and the hardener.
3. Mix the epoxy using the divider.

**Note:** The epoxy must be thoroughly mixed until both parts are blended into a smooth uniform color.



4. Locate the syringe in the D-182977 or the D-182983 consumables kits.
5. Place the syringe tip on the syringe and twist to lock in place.
6. Remove the plunger from the syringe.
7. Fold the epoxy package in half and cut off one of the package corners.
8. Squeeze the mixed epoxy into the syringe.

**Note:** A ¾-inch (19 mm) length of epoxy will be enough for about 50 connectors.



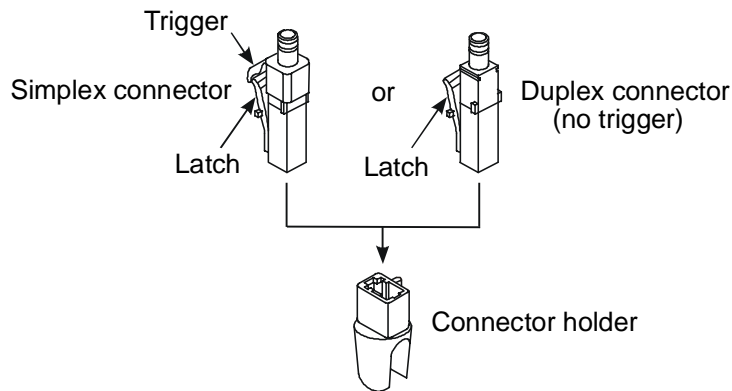
9. Replace the plunger into the syringe.
10. Remove air pockets from the syringe by holding the syringe tip upward and ejecting epoxy until the air pockets are removed.

## 6. Connector Installation

Connectors are provided in packages which must be ordered by product codes (see Section 10 for **LC Connector Product Codes**). Each connector is fitted with a white dust cap to protect the connector tip from damage and contamination. During the connector installation process a holder (provided in the D-182959 Upgrade Kit) is used to protect the fiber protruding from the connector tip and to aid in the handling of the small connectors.

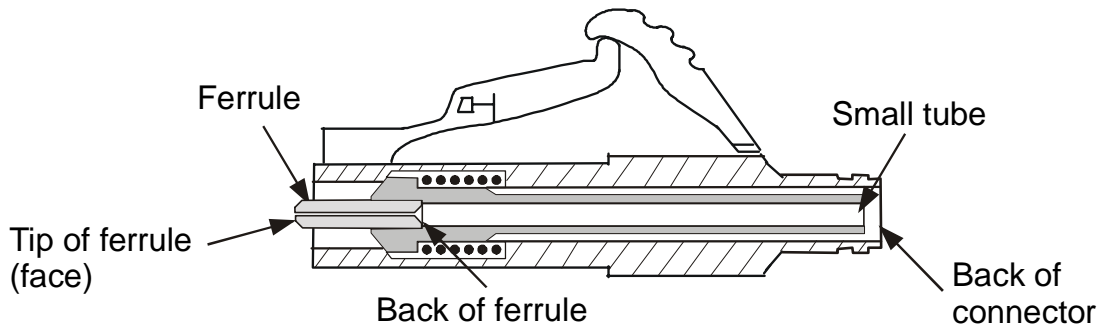
### 6.1 Prepare the Connector

1. Locate the connector to be installed and remove the white dust cap.
2. Locate a connector holder from the upgrade kit and snap the connector into the holder.



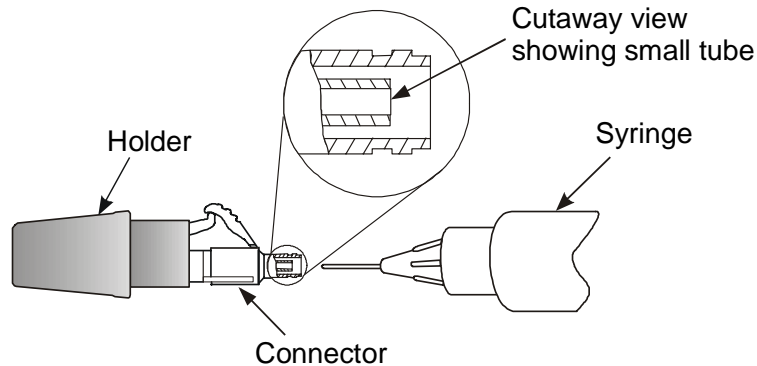
### 6.2 Apply Epoxy

Epoxy is injected into two areas of the connector: (1) inside of the ferrule and (2) at the back of the ferrule. The syringe is first used to inject epoxy into the ferrule. This epoxy bonds the stripped fiber to the ferrule. Before removing the syringe from the connector, epoxy must next be deposited at the back of the ferrule. This epoxy bonds the buffer at the back of the ferrule. **DO NOT** apply an excessive amount of epoxy to either the ferrule or at the back of the ferrule.



**Note:** Simplex connector shown.

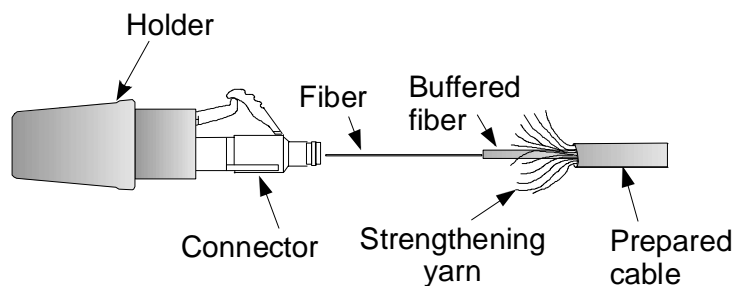
1. Visually locate the small tube inside the back of the connector.



2. Carefully insert the tip of the syringe into the small tube until it bottoms.  
**Caution:** In the following step, do not apply excess epoxy to the connector tip of the ferrule.
3. Inject epoxy into the ferrule by slowly pressing the syringe plunger until the epoxy **just** appears at the connector tip (face of the ferrule).
4. Deposit epoxy at the back of the ferrule by pulling the tip of the syringe back slightly and momentarily injecting a small amount of epoxy at the back of the ferrule.  
**Caution:** When removing syringe from the connector in the following step, do not allow epoxy on syringe tip to contaminate the small tube or the back of the connector.
5. Release pressure on plunger, wait a moment, and then remove the syringe from the connector.

### 6.3 Insert Fiber

1. Remove prepared fiber from holder block.
2. Insert the exposed fiber into the small tube inside the connector and carefully feel for the opening in the ferrule.  
**Note:** Rotating the fiber or the connector assembly may help to locate the opening.  
**Caution:** Only perform the following step once.
3. When the fiber is seated, pull it back slightly and watch for fiber movement at the tip of the connector to make sure the fiber is not broken.
4. Reposition the fiber back into the connector.

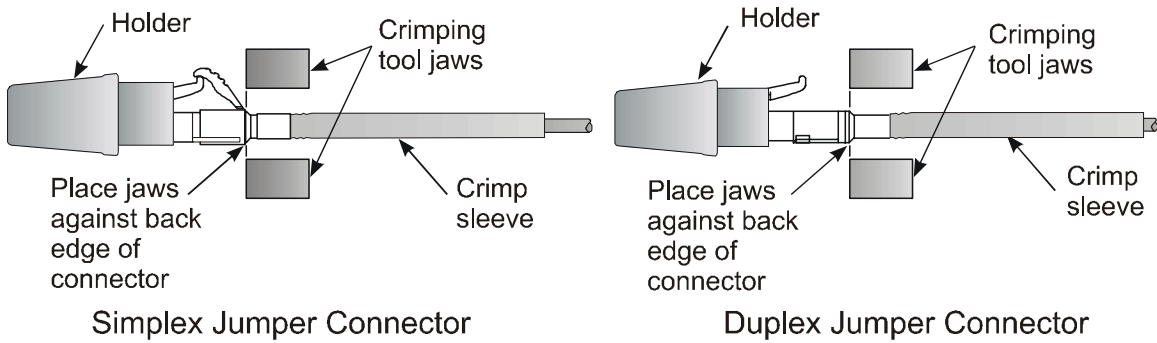


## 6.4 Install Crimp Sleeve

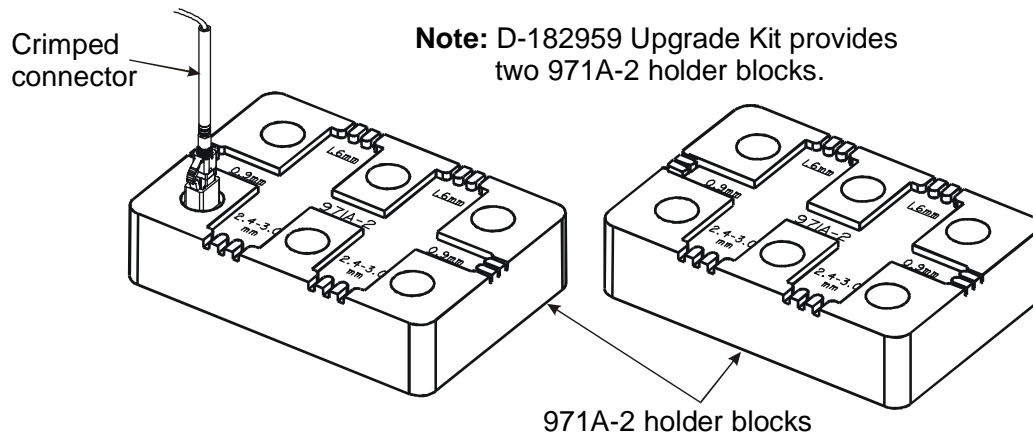
1. Slip the cable crimp sleeve assembly over the back of the connector while capturing the strengthening yarn.
2. Using the 1510LC crimping tool (supplied in the D-182959 kit), place the square edge of the connector against one edge of the crimp jaw with the crimp sleeve assembly lying through the crimp jaws.

**Caution:** Crimping the crimp sleeve more than once can weaken the connector.  
**CRIMP ONLY ONCE.**

3. Apply pressure until crimping tool completely closes and automatically opens.



4. Store crimped connector vertically in the holder block until up to 12 simplex or 6 duplex connectors have been crimped.





## 6.5 Cure Connector Assemblies

1. When the desired number of connectors has been prepared, place the holder block next to the preheated oven.
2. Place the crimped connector assemblies into the heat pipes.
3. Ensure that the connector assemblies are sitting at the bottom of the heat pipes.
4. Remove the assemblies from the heat pipes after they have cured for 10 minutes.

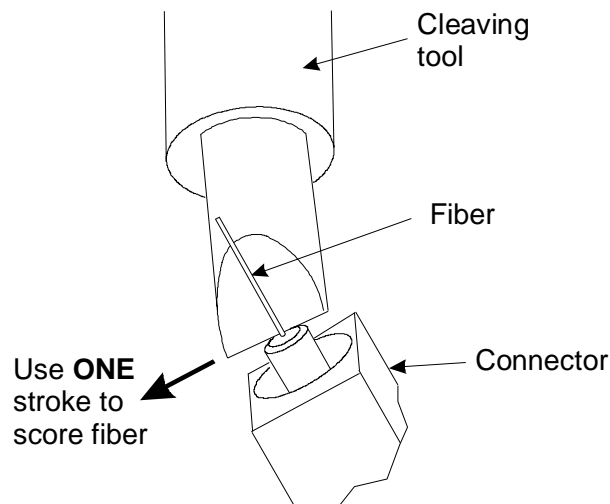
## 6.6 Cool Connector Assemblies

1. Place cured assemblies back into the holder block to cool.
2. **For simplex connectors:** Push the cable supports onto the connector. The cable support is properly installed when the cable support contacts the back of the connector. **Do NOT twist or forcibly push the cable support onto the connector.** Twisting or forcibly pushing the cable support onto the connector may damage the fiber.

**For duplex connectors:** Allow the connector holder assemblies to completely cool in the holder blocks. **Do not** install the cable support at this time.

## 6.7 Score the Fiber

1. Remove the connector from the connector holder.
2. Obtain the 975A cleaving tool from the 1032B5 Tool Kit or from the 1032B6 Tool Kit.  
**Note:** In the following step, score the fiber as close to the ferrule as possible while at the same time being careful not to break the fiber.
3. Place the cleaving tool against the ferrule and exposed fiber.
4. Using one stroke of the cleaving tool, gently score the exposed fiber.
5. Remove the exposed fiber by gently pulling straight away from the cable.  
**Note:** If fiber did not readily pull off, score fiber again on opposite side and gently pull fiber.
6. Dispose of the fiber scraps in a safe manner.  
**Note:** The adhesive surface on a piece of tape is a convenient place to hold fiber piece until disposal.



## 6.8 Polish Fiber End—Multimode and Singlemode

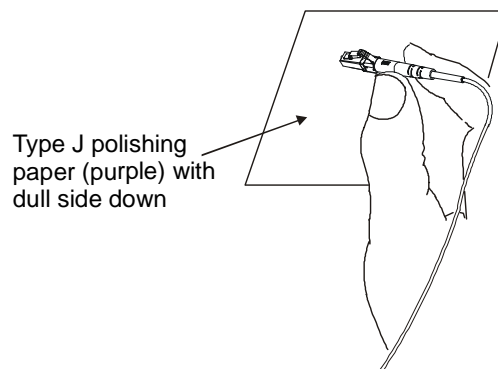
**Caution:** Contaminates on polishing materials can cause scratches on the end face of the fiber/ferrule. Throughout the entire polishing process, keep work area and all polishing materials clean. Clean polishing papers between each step using a wipe moistened with alcohol. This is especially true for the type F (yellow) and type K (gray) polishing papers because they can be repeatedly cleaned and reused.

**Note 1:** Tables A for multimode and B for singlemode provide a quick reference for polishing.

**Note 2:** Cut one sheet of type J polishing paper (purple) into four pieces.

### Step 1. Remove Fiber Stub

- a. In one hand, hold one of the cut pieces of type J polishing paper (dull side down).
- b. In the other hand, hold the connector with the tip pointing upward.  
**Note:** When performing the following step, be careful not to break the fiber stub.
- c. Air polish using light circular motions about 1 inch in diameter; carefully polish off fiber stub.

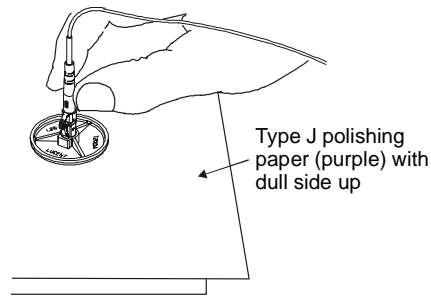


- d. Use canned air to clean the back and front of a full piece of type J polishing paper (purple).
- e. Saturate a wipe with isopropyl alcohol (>91% 2-propanol + water).
- f. Obtain a glass plate and a polishing tool (T2000A or T2001A) from D-182959 Upgrade Kit.
- g. Clean the glass plate and polishing tool with the saturated wipe.
- h. Use canned air to blow dry the glass plate and the polishing tool.
- i. Insert the **LC** connector into the T2000A or T2001A polishing tool.

### Step 2. Remove Excess Epoxy

- a. Place one clear spacer sheet on the glass plate, then place a sheet of type J polishing paper (purple) on the glass plate with the dull side up.
- b. Gently place the polishing tool and connector onto the polishing paper.  
**Note:** In the following step, you should **not** feel any drag between the fiber and the paper. Start with light pressure and use figure-8 strokes that are approximately 2 inches high and 1 inch wide. The figure-8 strokes must be well rounded to ensure complete removal of the epoxy from the end of the ferrule.
- c. Using light pressure, polish the connector for 20 figure-8 strokes.  
**Danger:** Optical fibers may emit radiation if the far end is connected with a working laser or Light-Emitting Diode (LED). Never view the fiber end of a cable or plug with the naked eye or any optical instrument until absolute verification is established that the fiber is disconnected from any laser or LED source.
- d. Using a 7X eye loupe or **LC** microscope supplied in the D-181259 Upgrade Kit, check the tip of the ferrule. No excess epoxy should surround the fiber.

**Note:** If excess epoxy is found, continue to use type J polishing paper (purple) to remove the excess epoxy.



### Step 3. Dome Ferrule End

- a. Place the following consumables on the glass plate: one white foam pad, five clear spacers, and on top place a sheet of type F polishing paper (yellow).

**Note:** Type F polishing paper can be reused by cleaning with alcohol and wipes as needed.

- b. Using light pressure, polish the connector for 20 figure-8 strokes.

**Note:** Step 3 concludes the polishing procedure for multimode fibers. Steps 4 and 5 are to be performed for singlemode fibers only.

### Step 4. Improve Dome Surface Finish

- a. Replace the sheet of type F (yellow) polishing paper with a sheet of type K (gray) dull side up. Leave the five clear spacers and foam pad on glass plate.
- b. Polish the connector for 20 additional figure-8 strokes.

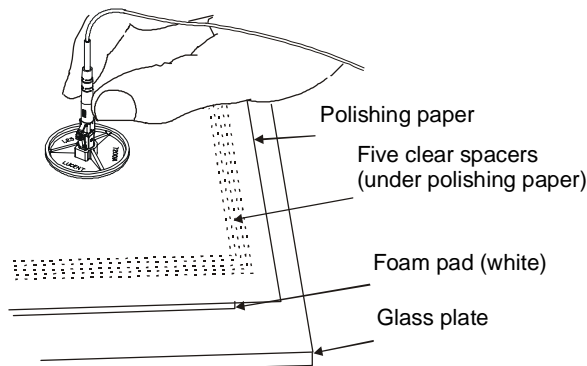
### Step 5. Singlemode Final Polish

- a. Remove all polishing material from glass plate and replace with type L felt polishing pad (purple).

**Note:** Step 5b is critical for excellent return loss. Perform carefully by guiding the polishing tool and plug slowly and gently, never increasing pressure.

- b. Dampen one-fourth of sheet with distilled water (do not flood). Buff polish 20 light figure-8 strokes, approximately 3 inches high and 1 ½ inches wide.
- c. Clean fiber end with wipe dampened with water, then with a second wipe dampened with alcohol.
- d. The felt can be stored damp in a clean plastic bag and reused. The glass plate should be immediately cleaned with water and dried completely before storage to prevent polishing residue from permanently drying on glass plate.

**Note:** Step 5 provides the necessary steps for high performance return loss. Type L felt polishing pad (purple) is imbedded with ultrafine polishing material.



**Table A. Overview—Polishing Multimode**

Step	Polishing Materials	No. of Figure-8 Strokes	Notes
1	Type J, purple	As Required	Air polish to remove fiber stub.
2	Type J, purple One spacer (clear)	20, then as required	Dry polish on glass plate to remove excess epoxy.
3	Type F, yellow Five spacers (clear), foam pad	20	Dry polish on glass plate to dome ferrule.
Repair polish, only if needed	Type F, yellow One spacer (clear)	As required to remove flaw	Repair polish. Dry polish on glass plate. After flaw is removed, repeat Step 3.

**Table B. Overview—Polishing Singlemode**

Step	Polishing Materials	No. of Figure-8 Strokes	Notes
1	Type J, purple	As Required	Air polish to remove fiber stub.
2	Type J, purple One spacer (clear)	20, then as required	Dry polish on glass plate to remove excess epoxy.
3	Type F, yellow Five spacers (clear), foam pad	20	Dry polish on glass plate to dome ferrule.
4	Type K, gray Five spacers (clear), foam pad	20	Dry polish on glass plate to improve dome surface finish.
5	Type L, purple felt	20 light	Dampen felt with distilled water for final finish.
Repair polish, only if needed	Type F, yellow One spacer (clear)	As required to remove flaw	Repair polish. Dry polish on glass plate. After flaw is removed, repeat Step 3.

## 6.9 Repair Polishing Only

- Place a sheet of type F paper and one clear spacer over the glass plate.
- Using little or no pressure, polish the connector until the flaw has been removed.
- Repeat Step 3 in Section 6.8.
 

**Note:** Do not over polish. Approximately one-third of the chamfer length can be polished away. This concludes the repair procedure for multimode fibers.
- For singlemode fibers only, repeat Steps 4 and 5 in Section 6.8.

## 6.10 Final Assembly

### 6.10.1 Simplex Connectors

- Ensure that connector has been polished and the end finish is acceptable.
- Cover the end of the connector with the white dust cap supplied with the connector.

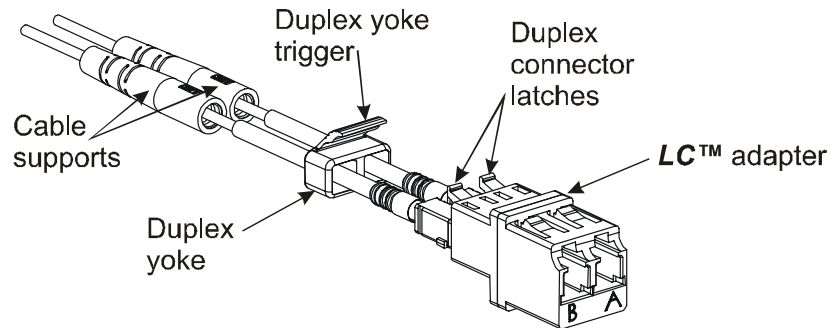
### 6.10.2a Duplex Connectors (with Regular Duplex Yoke)

- Ensure that each connector has been polished and the end finish is acceptable.
- Snap the duplex connectors into the **LC** adapter supplied in the D-182959 (108 262 569) Upgrade Kit.

**Note:** The **LC** adapter is a temporary aid used in installing the final components of the connector assembly.

- Ensure that the cords are not twisted.
- Slip duplex yoke over the cable and onto the back of the connectors until it snaps into place.

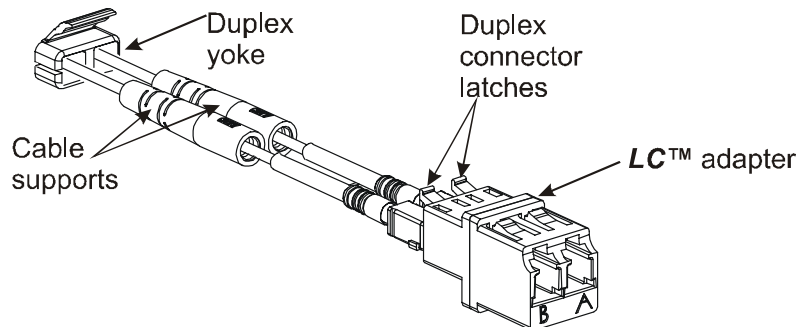
**Note:** The latches on the connectors should be aligned and nested just under the trigger on the duplex yoke.



5. With the connectors still inside the adapter, attach cable supports to the back of connectors.  
**Note:** Attach each cable support by pushing forward. **Do not twist and push.** Twisting and pushing may damage the fiber. When properly seated, the cable support should positively contact the back of the connector and/or duplex yoke.
6. Remove the connectors from the adapter and replace the white dust caps.
7. Repeat Steps 1 through 6 for other end of the cord.

#### 6.10.2b Duplex Connectors (with Replaceable Duplex Yoke)

1. Ensure that each connector has been polished and the end finish is acceptable.
2. Snap the duplex connectors into the **LC** adapter supplied in the D-182959 (108 262 569) Upgrade Kit.  
**Note:** The **LC** adapter is a temporary aid used in installing the final components of the connector assembly.
3. Ensure that the cords are not twisted.
4. With the connectors still inside the adapter, attach cable supports to the back of connectors.  
**Note:** Attach each cable support by pushing forward. **Do not twist and push.** Twisting and pushing may damage the fiber. When properly seated, the cable support should positively contact the back of the connector.
5. Slip duplex yoke over the cable support and onto the back of the connectors and snap it into place.\*  
**Note:** The latches on the connectors should be aligned and nested just under the trigger on the duplex yoke.



6. Remove the connectors from the adapter and replace the white dust caps.
7. Repeat Steps 1 through 6 for other end of the cord.

\*The Replaceable Duplex Yoke should be installed one time only. Replaceable yokes are available in bulk pack, see Ordering Information in the back of the manual.

## 7. Fiber Inspection and Ferrule Endface Geometry

### 7.1 Fiber Inspection

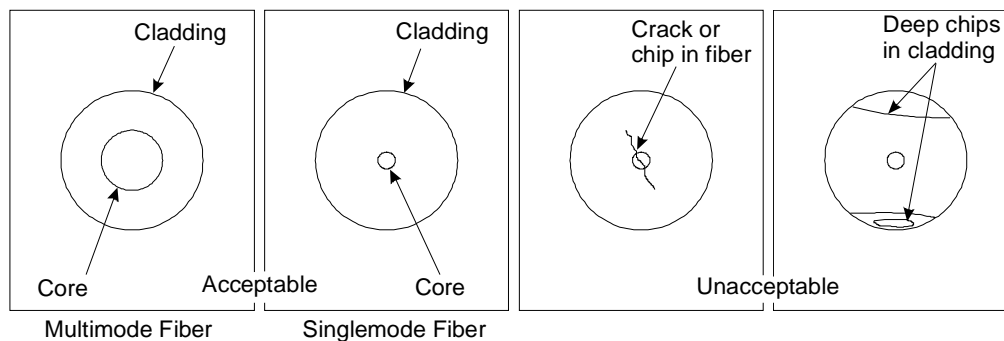
**Danger:** Optical fibers may emit radiation if the far end is connected with a working laser or light-emitting diode (LED). Never view the fiber end of a cable or plug with the naked eye or any optical instrument until absolute verification is established that the fiber is disconnected from any laser or LED source.

**Note:** The fiber endface should be clean and contaminant free.

1. Dampen a wipe with isopropyl alcohol (>91% 2-propanol + water).
2. Clean the end of the ferrule with the dampened wipe, followed by a dry wipe.
3. Blow the ferrule dry with canned air.
4. Locate the **LC** microscope supplied in the D-182905 or D-182959 Upgrade Kit.
5. Insert the ferrule end of the connector into the microscope adapter (center hole).

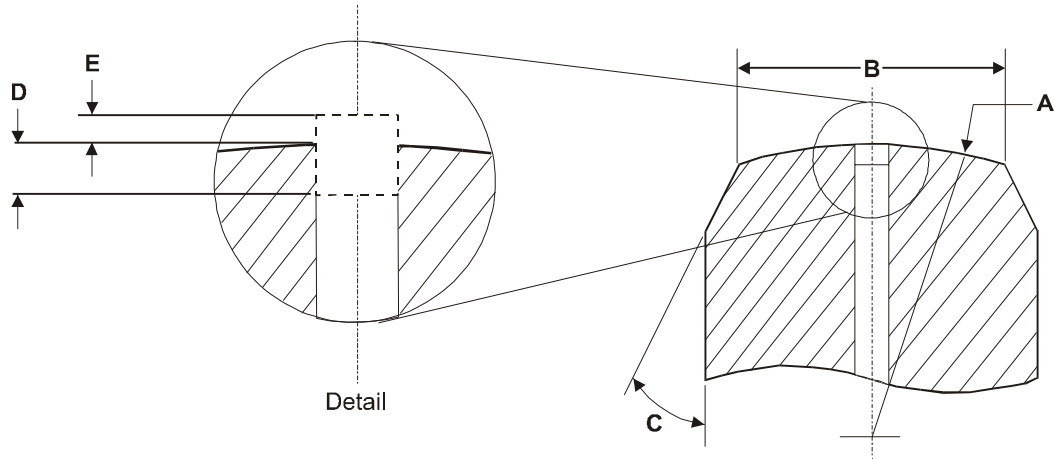
**Danger:** A high-intensity light may be used at distant end of fiber to illuminate fiber core.

6. Open the microscope barrels to illuminate the connector tip and use the side wheel to focus.



## 7.2 Ferrule Endface Geometry

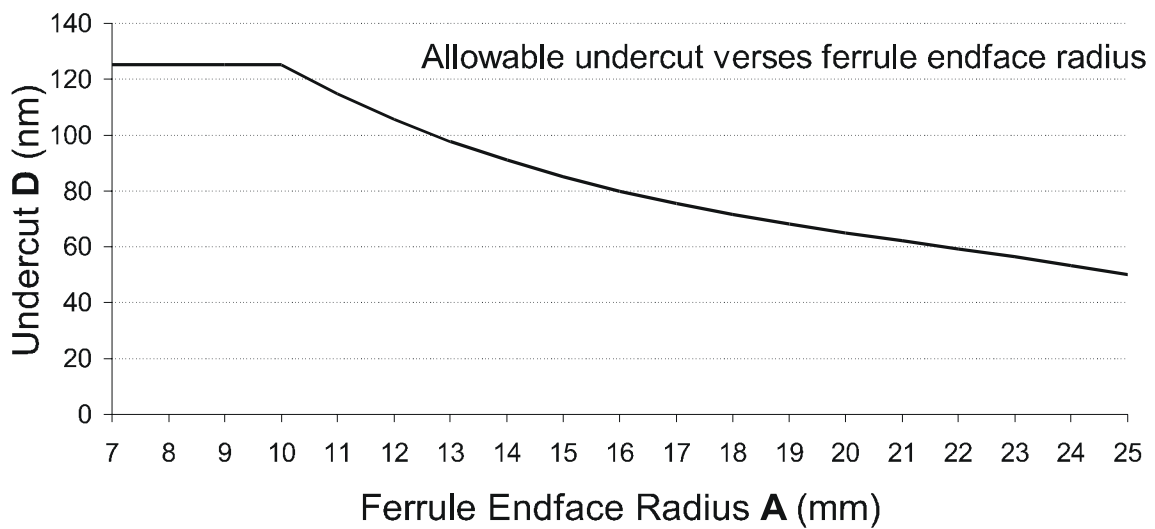
The dimensions in Table C are for reference only and apply after all polishing procedures have been completed.



**Table C. Recommended Singlemode Ferrule End Geometry**

Item	Reference	Minimum	Nominal	Maximum	Dimensions
Radius	A	7	12	25	mm
Pedestal	B	0.8	0.9	1.0	mm
Dome Ecc	—	0	—	0.050	mm
Chamfer	C	25	30	35	degrees
Undercut	D	—	—	See Graph A	nm
Protrusion	E	—	—	50	nm

**Graph A. Recommended Fiber Undercut (Reference D)**



## 8. Cleaning Instructions

### 8.1 LC Connector

1. Dampen a wipe with isopropyl alcohol (>91% 2-propanol + water).
2. Clean the end of the ferrule with the dampened wipe.
3. Blow the ferrule dry with canned air.

**Caution:** Signal performance **will** be affected if the connector tip is not thoroughly cleaned.

### 8.2 Adapter

1. If access to the adapter is only available from one side, use canned air to blow inside of adapter.
2. If access is available from both sides of the adapter, clean the adapter with the **LC** adapter brush moistened with alcohol followed by canned air. The brush can be cleaned with alcohol and canned air.

**Warning:** Do not try to clean adapter with a standard pipe cleaner. The **LC**'s sleeve inner diameter is too small. Also, do not try to clean the adapter with **LC** adapter brush if a connector is mounted in the adapter.



## 9. Tuning Instructions

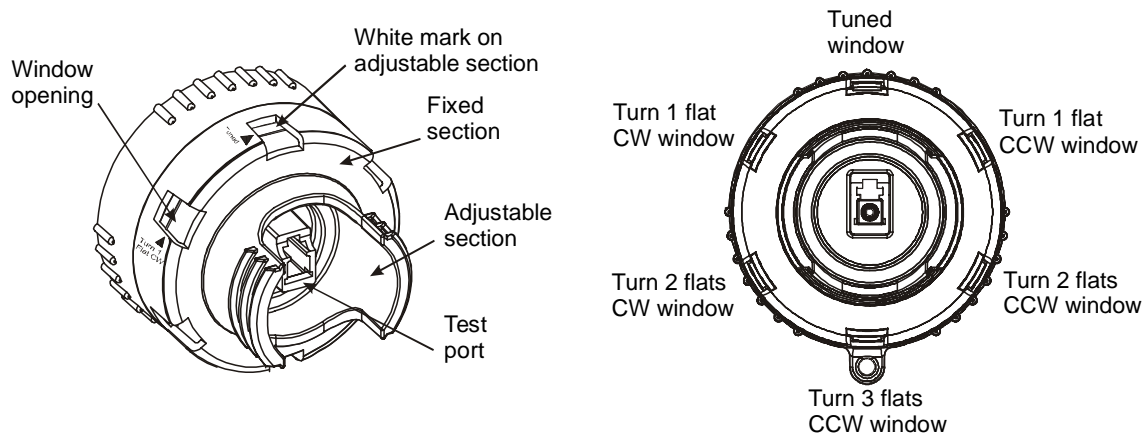
### 9.1 General Information

The D-183017 **LC** Tuning Kit\* (108 476 094) is comprised of the following:

- Tuning Index Tool
- Tuning Wrench
- Singlemode Offset Tuning Jumper
- Hard case with foam insert
- Instruction card.

#### 9.1.1 Tuning Index Tool

The Tuning Index Tool is used to determine which of six ferrule positions yields the lowest insertion loss in both jumper and Behind-The-Wall (BTW) connectors. The tool is made of high impact plastic with one fixed section and one adjustable section. These two sections are held together by an interior coil spring that maintains an inward tension on the two sections to keep them in a stationary position. Both sections are equipped with a test port that is used to install the Singlemode Offset Tuning Jumper and the jumper or BTW connector to be tuned. There are six window openings located around the rim of the fixed section. These window openings are 60 degrees apart and are used to view a white reference mark on the inner rim of the adjustable section. Stamping beside each window provides the number of turns needed to tune the connector ferrule of the jumper or BTW connector being tuned. The “flat” or “flats” reference in the window stamping indicates one of the six flat positions in the hexagon handle of the Tuning Wrench that is provided in the Tuning Kit. To move the Tuning Index Tool from its stationary position, pull the adjustable section away from the fixed section and rotate clockwise or counterclockwise in increments of 60 degrees.



#### 9.1.2 Tuning Wrench

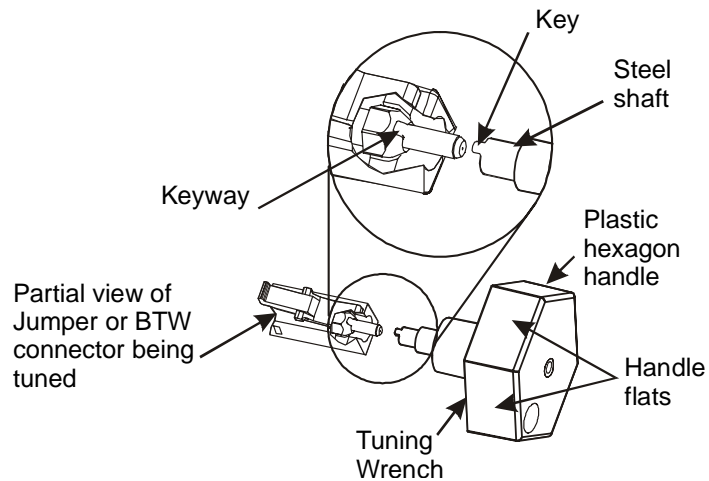
The Tuning Wrench is used to rotate the barrel/ferrule of the connector being tuned to a position that will yield the lowest insertion loss. The Tuning Wrench is comprised of a steel shaft molded into a plastic hexagon handle. Two keys are milled into the end of the steel shaft and these keys are used to engage the keyways located in the barrel/ferrule of the connector being tuned. To rotate the barrel/ferrule, you must first place the Tuning Wrench keys in the barrel/ferrule keyways, second press in on the Tuning Wrench until it bottoms out on the face of the connector housing, and third turn the wrench to the desired flat. The number of flats and the direction to be turned is obtained from the printing on the rim of the fixed section of the Tuning Index Tool [for example, Turn 2 flats CW (clockwise) or Turn 2 flats CCW (counterclockwise)].

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\* Patents Pending.

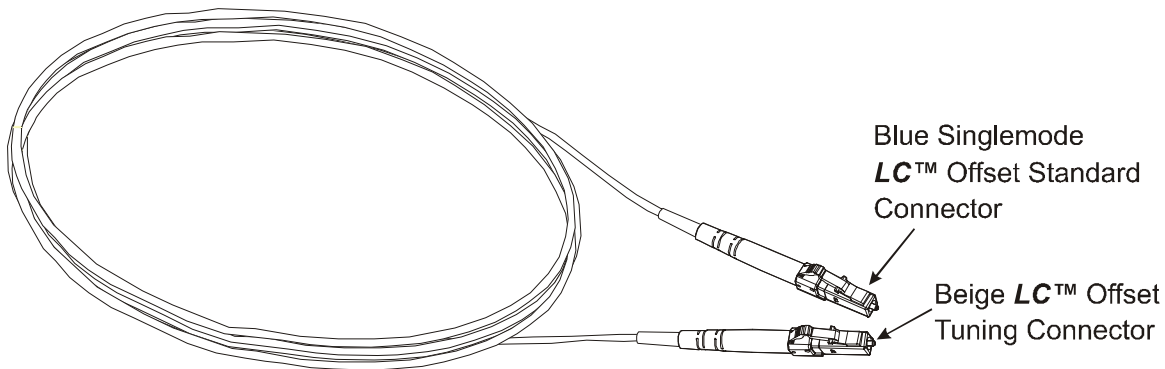
**Caution 1:** Damage will occur to the Tuning Wrench or the connector barrel/ferrule if the Tuning Wrench is rotated without the wrench being bottomed against the connector housing.

**Caution 2:** Damage may occur to a jumper connector if the barrel/ferrule is rotated more than 180 degrees (three flats) in either the clockwise or counterclockwise direction.



### 9.1.3 Singlemode Offset Tuning Jumper

The Singlemode Offset Tuning Jumper is used to make the connection between the insertion loss test set and the test port in the adjustable section of the Tuning Index Tool. The jumper consists of one beige **LC** tuning connector and one blue standard singlemode connector mounted on approximately 10 feet (3 m) of yellow cordage. The beige connector with the black trigger is the offset tuning end of the jumper.



### 9.1.4 Hard Case with Foam Insert

The hard case provides a safe and convenient way to transport the **LC** Tuning Kit. It is made of high impact plastic with a foam insert.

### 9.1.5 Instruction Card

The instruction card provides an abbreviated procedure for tuning **LC** singlemode connectors.

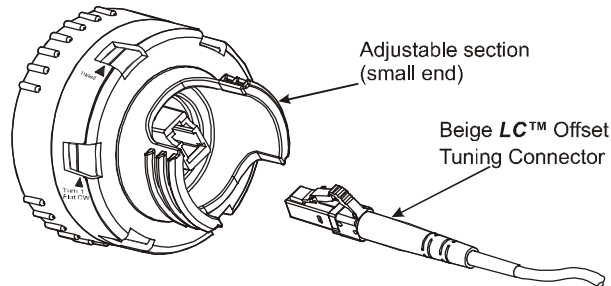
## 9.2 Safety Information

- Safety glasses should be worn at all times while working with **LC** connectors.
- Optical fibers may emit radiation if the far end is connected with a working laser or light-emitting diode (LED). Never view the fiber end of a cable or plug with an optical instrument until it is verified that the fiber is disconnected from any laser or LED source.

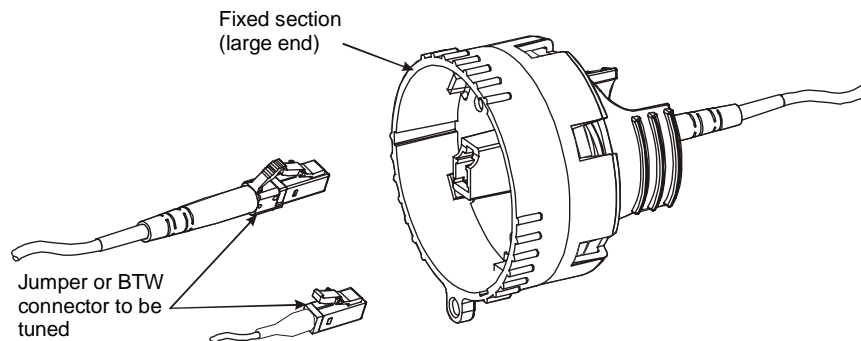
### 9.3 Tuning Procedure

**Note:** Before starting the tuning measurements, make a copy of the tuning sheet on the following page.

1. Install the beige **LC** Offset Tuning Connector into test port of the adjustable section (small end) of Tuning Index Tool.



2. Install jumper or BTW connector to be tuned into the test port of the fixed section (large end) of Tuning Index Tool.



3. Make insertion loss measurement and record in the appropriate column on copied tuning sheet.

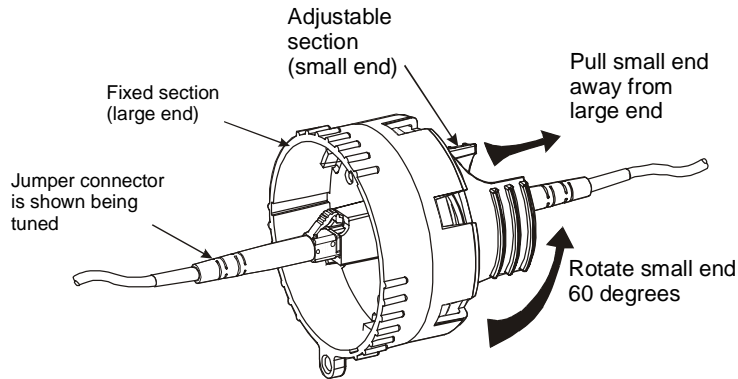
**Note:** It is not necessary to remove the tuning jumper or the jumper/BTW connector from the Tuning Index Tool until Step 10.

Jumper No.	Tuning Index Tool Position					
	Tuned	Turn 1 Flat CCW	Turn 2 Flats CCW	Turn 3 Flats CCW	Turn 2 Flats CW	Turn 1 Flat CW
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						

4. Grasp the small end of the Tuning Index Tool with one hand and large end of the Tuning Index Tool with the other hand.
5. Pull small end away from large end and rotate small end 60 degrees in clockwise direction.

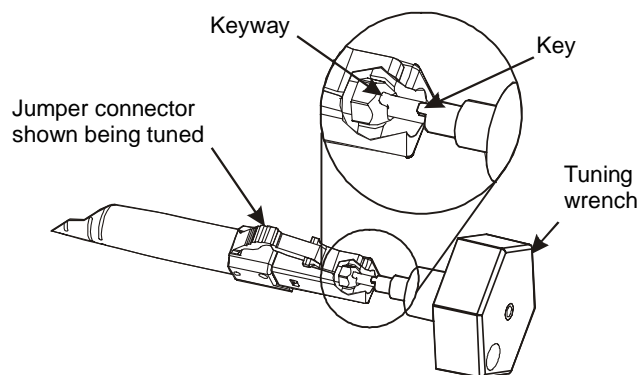
**Note 1:** It takes 3-4 pounds (0.9-1.8 kilograms) of force to separate the two halves of the Tuning Index Tool properly.

**Note 2:** White reference mark is now showing in a different window.

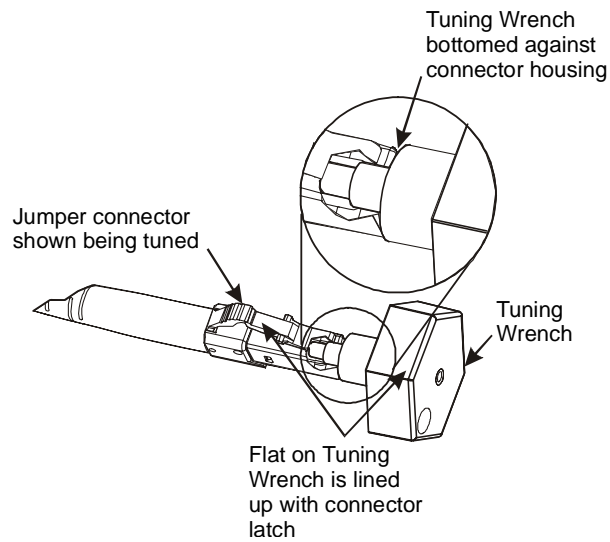


6. Record insertion loss measurement for each position or window in appropriate column on the copied tuning sheet.
7. Repeat Steps 4 through 6 for the remaining four Tuning Index Tool window positions.
8. Refer to the tuning sheet and determine which window position yielded the lowest insertion loss.
9. Note the number of turns and direction that is stamped next to the window position that yielded the lowest insertion loss (for example, **Turn 2 flats CW**).
10. Remove jumper or BTW connector being tuned from the Tuning Index Tool.
11. Place Tuning Wrench over jumper or BTW connector ferrule and engage the wrench keys into the connector keyways.

**Note:** The wrench keys are engaged in the connector keyways by applying very light inward pressure on the wrench and rotating until you feel the keys engage.



12. With the wrench keys engaged in the connector keyways, push the wrench into the connector until the wrench bottoms against the connector housing.
13. Note that one of the flat portions of the Tuning Wrench is aligned with the connector latch.



**Caution 1:** Damage will occur to the Tuning Wrench or the connector barrel/ferrule if the Tuning Wrench is rotated without the wrench being bottomed against the connector housing.

**Caution 2:** Damage may occur to a jumper connector being tuned if the barrel/ferrule is rotated more than 180 degrees (three flats) in either the clockwise or counterclockwise direction.

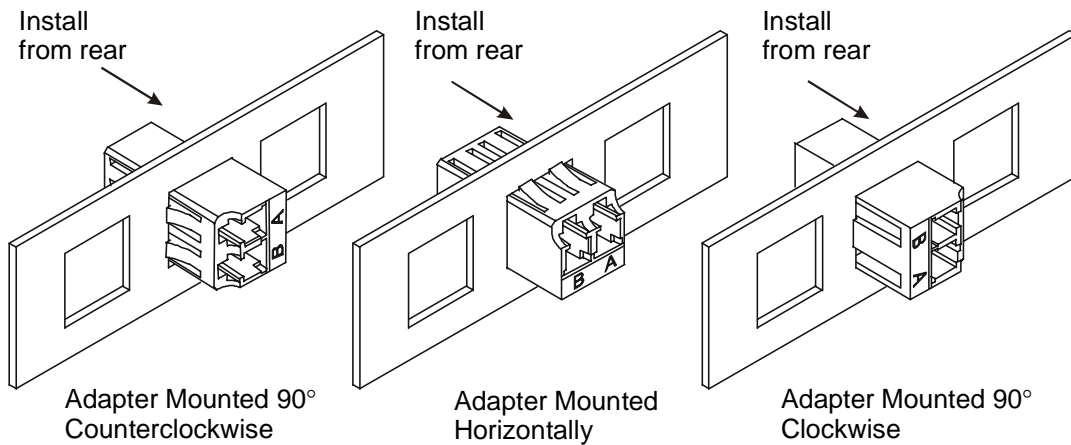
14. Hold connector stable and rotate the wrench the number of hex flats and in the direction determined in Step 9.
15. Remove the Tuning Wrench from connector.  
**Note:** The jumper is now tuned per the measurements taken in Steps 3 through 7.
16. For a jumper, repeat this procedure for the connector on the other end of the jumper cable.  
**Note:** The following steps are optional.
17. Realign the white reference mark on adjustable section of Tuning Index Tool in the **Tuned** window.
18. Repeat Steps 3 through 16 to ensure that the connector has been set to the position that provides the lowest insertion loss.

## 10. Mount Adapter

**Caution:** The adapter should never be installed from the front of a panel or outlet.

1. Locate the panel or outlet where the adapter is to be mounted.
2. Install the adapter **from the rear** of the panel or outlet.

**Note:** The channel markings (B A) are normally oriented horizontally. However, it is acceptable to orient the adapter 90° clockwise or 90° counterclockwise. This rotated orientation will allow finger access to the connectors for insertion and removal in dense applications. Do not install with the channel markings (B A) upside down.



## 11. Ordering Information

### 1032B5 Tool Kit (106 705 213)

Kit Quantity	Description	Replacement	
		Comcode	Quantity
1	1510B Crimping Tool	106 918 998	1 Tool
1	300B Microscope	104 412 077	1 Microscope
1	1510A Polishing Tool	106 918 980	1 Tool
12	600B Connector Holders	107 118 549	12 Holders
1	700A Stripping Tool	104 278 478	1 Tool
1	1026A Heat Strip Tool	105 514 764	1 Tool
2	971A-1 Holder Blocks	104 229 398	1 Block
1	975A Cleaving Tool	103 808 770	1 Tool
1	Scissors	105 257 364	2 Pairs
1	6-inch Scale	105 257 356	5 Scales
1	Alcohol Bottle	105 257 463	2 Bottles
1	Glass Plate	105 075 618	2 Plates
1	Stripping Tool (R4366)	105 114 581	1 Tool
1	Instruction Manual	105 536 718	1 Manual
15	Micro Clips (1043A)	106 228 455	15 Clips
1	200A Curing Oven	104 055 058	1 Oven
12	SC Curing Fixtures	106 919 004	12 Fixtures
1	Rubber Polishing Pad	106 978 992	10 Pads
1	1039B Cut-Length Template	107 149 783	5 Templates
2	Modified SM/MM SC Grips	107 480 022	10 Grips
1	ST <sup>®</sup> /SC Connectors Assembly Instructions – Epoxy and EZ Methods	See Note	1 Manual

**Note:** Obtain ST<sup>®</sup>/SC Connectors manual (640-252-044) from field support (1-888-342-3743).

### 1032B6 Tool Kit (106 919 012)

The 1032B6 Tool Kit contains the same tools and materials as the 1032B5 Tool Kit except the 200A Curing Oven is replaced by the 200A1 Curing Oven for use internationally. The 200A1 oven operates on 220 V 50 Hz. Replacement comcode for the 200A1 oven is 105 537 690 and is replaced in quantities of one each.

### LC<sup>™</sup> Connector Accessories

Description	Comcode	Quantity
External LC Dust Caps – Electric White	<b>108 925 413</b>	1000/pack
External LC Dust Caps – Yellow	<b>108 925 454</b>	1000/pack
External LC Dust Caps – Red	<b>108 925 937</b>	1000/pack
External LC Dust Caps - Green	<b>108 925 405</b>	1000/pack
LC BTW Anti-Snag Clips	<b>108 827 403</b>	200/pack
LC Replaceable Duplex Clips – SM (Blue)	<b>109 170 878</b>	1000/pack
LC Replaceable Duplex Clips – MM (Beige)	<b>109 170 886</b>	100/pack
LC Replaceable Duplex Clips – MM (Beige)	<b>109 170 894</b>	1000/pack
LC 2.0 mm Crimp Sleeves – Yellow	<b>109 126 425</b>	1000/pack
LC 2.0 mm Crimp Sleeves – White	<b>109 126 433</b>	1000/pack



## D-182959 Upgrade Kit for LC™ Jumper and BTW Connectors (108 262 569)

Kit Quantity	Description	Replacement	
		Comcode	Quantity
1	T2001A Polishing Tool	108 209 651	1 Tool
1	LC Microscope	107 863 946	1 Microscope
12	LC BTW Connector Holders	107 852 493	12 Holders
12	LC Jumper Connector Holders	108 262 585	12 Holders
2	971A-2 Holder Block	108 266 123	1 Block
1	LC Cut Length Template	108 262 536	5 Pads
1	1510LC Crimping Tool	108 262 551	1 Tool
1	LC Stripper Guide Tube for 1026A	108 262 577	1 Insert
1	Ultra-Fine-Point Permanent Pen	NA	1 Pen
6	Heat Tube Assemblies	108 261 835	6 Assemblies
6	LC Adapter Brush	108 263 898	6 Brushes
1	C1001B-2 Multimode LC Adapter	108 072 497	1 Adapter
1	Assembly Instructions for LC Fiber Optic Jumper Connectors	See Note 1	1 Manual
1	Assembly Instructions for LC Fiber Optic Behind-The-Wall (BTW) Connectors	See Note 2	1 Manual

**Note 1:** Obtain Jumper Connectors manual (640-252-054) from field support (1-888-342-3743).

**Note 2:** Obtain BTW Connectors manual (640-252-053) from field support (1-888-342-3743).

## D-182977 Kit of Consumables, Singlemode (108 338 591)

**Note:** Kit contains enough supplies to field-assemble 200 singlemode LC™ connectors using heat cured epoxy.

Kit Quantity	Description
2 Packages	Wipes
1 Vial	Music Wire
15 Syringes	Syringes
25 Tips	Dispensing Tips
1 Package	Epoxy 15 bi-packs
10 Sheets	Clear Spacers 6 by 6 inches (150 by 150 mm)
10 Sheets	Foam Pad (white) 6 by 6 inches (150 by 150 mm)
20 Sheets	Type J Polishing Paper (purple) 6 by 6 inches (150 by 150 mm)
5 Sheets	Type F Polishing Paper (yellow) 6 by 6 inches (150 by 150 mm)
5 Sheets	Type K Polishing Paper (gray) 6 by 6 inches (150 by 150 mm)
10 Sheets	Type L Polishing Paper (purple) 6 by 6 inches (150 by 150 mm)
1 Package	LC Adapter Brush 6 items (Note)

**Note:** A six-pack of brushes is provided in the D-182959 Upgrade Kit (108 262 569). A six-pack of adapter brushes (108 263 898) can be ordered separately.

## D-182983 Kit of Consumables, Multimode (108 340 811)

**Note:** Kit contains enough supplies to install 200 multimode LC fiber optic connectors using heat-cured epoxy. The kit is the same as the D-182977 kit except no type K polishing paper and type L polishing felt are provided.

## D-183017 Singlemode Tuning Kit (108 476 094)

Qty.	Description	Replacement No.	
		Comcode	Quantity
1	<b>LC</b> <sup>TM</sup> SM Offset Test Jumper	108 476 110	1
1	<b>LC</b> Tuning Index Tool Assembly	108 476 151	1
1	<b>LC</b> Tuning Wrench	108 476 136	1
1	Instruction Card (See Note)	848 339 305	1
1	Hard Case w/ foam insert	NA	NA

**Note:** Obtain instruction card from field support (1-888-342-3743).

## **LC**<sup>TM</sup> Connector Product Codes

Product Code	Description	Comcode	Package
P1000A-Z-125	MM Simplex Jumper Connector	108 064 445	1
P1100A-Z-125	SM Simplex Jumper Connector	108 064 452	1
P1002A-Z-125	MM Duplex Jumper Connector	108 138 678	1
P1002A-Z-125/100	MM Duplex Jumper Connector	108 241 977	100
P1102A-Z-125	SM Duplex Jumper Connector	108 137 605	1
P1102A-Z-125/100	SM Duplex Jumper Connector	108 241 969	100
P1102B-Z-125	Two SM Simplex Jumper Connectors for Duplex Cord	108 267 295	1

## Reference (Golden) Singlemode **LC**<sup>TM</sup> Jumper Product Codes

The Reference (Golden) Singlemode **LC** Jumper can be used to measure optical performance using a standard singlemode **LC** adapter. This reference jumper has a yellow connector trigger.

Product Code	Description	Comcode	Quantity
<b>MS1GLC-LC-5</b>	SM Reference Jumper - <b>LC</b> Reference to Standard <b>LC</b> , Length 5 feet	108 513 045	1
<b>MS1GLC-LC-10</b>	SM Reference Jumper - <b>LC</b> Reference to Standard <b>LC</b> , Length 10 feet	108 513 052	1
<b>MS1GLC-LC-15</b>	SM Reference Jumper - <b>LC</b> Reference to Standard <b>LC</b> , Length 15 feet	108 513 060	1
<b>MS1GLC-LC-20</b>	SM Reference Jumper - <b>LC</b> Reference to Standard <b>LC</b> , Length 20 feet	108 513 078	1
<b>MS1GLC-SC-10</b>	SM Reference Jumper - <b>LC</b> Reference to Standard SC, Length 10 feet	108 513 086	1
<b>MS1GLC-FC-10</b>	SM Reference Jumper - <b>LC</b> Reference to Standard FC, Length 10 feet	108 513 094	1
<b>MS1GLC-EP-10</b>	SM Reference Jumper - <b>LC</b> Reference to Standard ST II+, Length 10 feet	108 513 102	1
<b>MS1GLC-SCA-10</b>	SM Reference Jumper - <b>LC</b> Reference to Standard Angled SC, Length 10 feet	108 547 860	1

## Obtain Locally

- Distilled water.
- Isopropyl alcohol (>91% 2-propanol + water).
- Canned air (non-ozone depleting).
- Alternate adhesives. (Locally obtained adhesives with shorter shelf life and higher T<sub>g</sub> for outside plant use are acceptable alternates, such as EPO-TEK\* 353ND adhesive.)

## 12. Assistance Information

For more information, contact your OFS Fitel Sales Representative or call 1-800-344-0223.

For fiber optic technical assistance, call 1-888-FIBERHELP (1-888-342-3743) or contact your Network Cable Systems Representative.

### Revision History:

Issue 4 12/20/2001 T. Barry Mock

Added information regarding replaceable duplex clip to section 4.1.3 & 6.10.2. Also updated drawings to reflect UniBody LC, and added ordering information at back of manual for LC accessories.

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\* EPO-TEK is a registered trademark of Epoxy Technology Incorporated.