

Assembly Instructions for Pre-radiused **LC™** Fiber Optic Jumper Connectors

**Epoxy Method for Singlemode and Multimode Pre-radiused LC
Simplex and Duplex Connectors Used on 1.6-mm MiniCord™ and
3.0-mm Cordage**

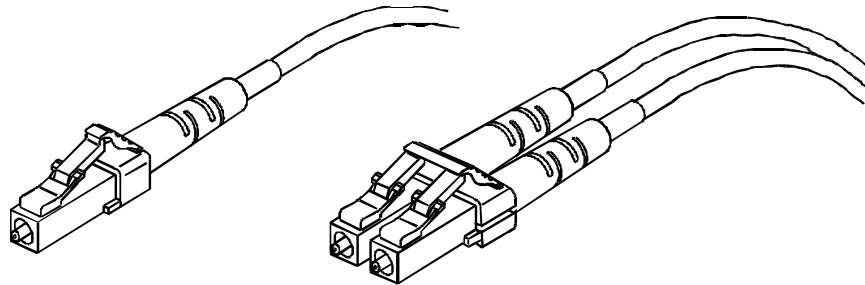


Table of Contents

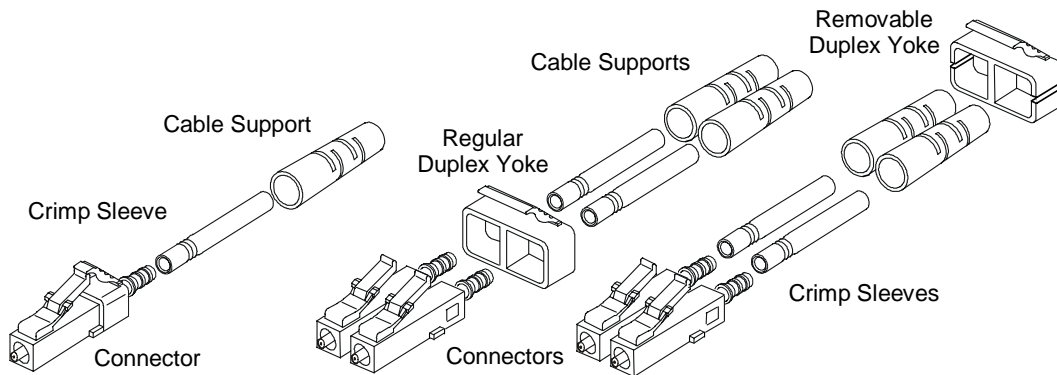
Epoxy Method for Singlemode and Multimode Pre-radiused LC Simplex and Duplex Connectors Used on 1.6-mm MiniCord™ and 3.0-mm Cordage	1
1. General.....	1
1.1 LC™ Jumper Connectors.....	1
1.2 Consumables.....	1
1.3 Epoxy Tool and Upgrade Kits.....	1
1.4 Crimp Tools & Die Sets.....	2
1.5 Ordering Information.....	2
2. Safety Precautions.....	2
3. Oven Preparation.....	2
3.1 Set Up Curing Oven.....	2
4. Cord Preparation.....	3
4.1 Assemble Connector Components (for 1.6, 2.0, or 3.0-mm Cordage).....	3
4.1.1 Simplex Applications on a Simplex Cord	3
4.1.2 Singlemode Simplex Applications on a Duplex Cord	4
4.1.3a Duplex Applications on a Duplex Cord (with Regular Duplex Yoke)	5
4.1.3b Duplex Applications on a Duplex Cord (with Replaceable Duplex Yoke)	6
4.2 Remove Outer Jacket and Trim Strengthening Yarn.....	7
4.3 Remove Buffer and Fiber Coating.....	8
4.4 Clean Stripped Fiber.....	9
5. Epoxy Preparation.....	10
6. Connector Installation.....	11
6.1 Prepare the Connector.....	11
6.2 Apply Epoxy.....	12
6.3 Insert Fiber.....	12
6.4 Install Crimp Sleeve.....	13
6.5 Cure Connector Assemblies.....	14
6.6 Cool Connector Assemblies.....	14
6.7 Score the Fiber.....	14
6.8 Polish Fiber End—Multimode and Singlemode.....	15
6.9 Repair Polishing (Only If Needed).....	17
6.10 Final Assembly.....	17
6.10.1 Simplex Connectors	17
6.10.2a Duplex Connectors (with Regular Duplex Yoke)	17
6.10.2b Duplex Connectors (with Replaceable Duplex Yoke)	17
7. Fiber Inspection and Ferrule Endface Geometry.....	18
7.1 Fiber Inspection.....	18
7.2 Ferrule Endface Geometry.....	20
8. Cleaning Instructions.....	21
8.1 LC Connector.....	21
8.2 Adapter.....	21
9. Tuning Instructions.....	21
9.1 General Information.....	21

9.1.1	Tuning Index Tool.....	21
9.1.2	Tuning Wrench	22
9.1.3	Singlemode Offset Tuning Jumper	22
9.1.4	Hard Case with Foam Insert	23
9.1.5	Instruction Card	23
9.2	Safety Information.....	23
9.3	Tuning Procedure	23
10.	Mount Adapter	27
11.	Ordering Information.....	28
	Pre-radiused <i>LCTM</i> Connector Product Codes	29
	Reference (Golden) Singlemode <i>LCTM</i> Jumper Product Codes.....	31
12.	Assistance Information	31

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, 2.0, and 3.0-mm cordage. It is intended for use in Central Offices, Local Area Networks (LANs), and in patch cords for Premises Distribution Systems such as 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, 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 \geq 20 dB

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

1.2 Consumables

Kit Type (Note)	Kit Number	Comcode	Kit Includes
Universal Polishing Kit (Singlemode & Multimode)	NA	300 472 651	Polishing paper and other materials required to assemble 100 singlemode or multimode connectors. Epoxy not included.
Universal Polishing Kit (Multimode Only)	NA	300 486 552	Polishing paper and other materials required to assemble 100 multimode connectors. Epoxy not included.
Epoxy (Hysol 0151)	NA	105 489 355	15 bi-packs of heat curable epoxy
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 Crimp Tools & Die Sets

Cordage Size	Tool Description	Comcode	
1.6 and 2.0 mm	1510LC w/ #2685 Die Set	108 262 551	Included in D-182959 Kit and sold separately
3.0-mm	1510LC w/ #2652 Die Set	300 421 013	Sold separately
3.0-mm	#2652 Die Set for 1510LC Tool	300 506 391	Sold separately

1.5 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.

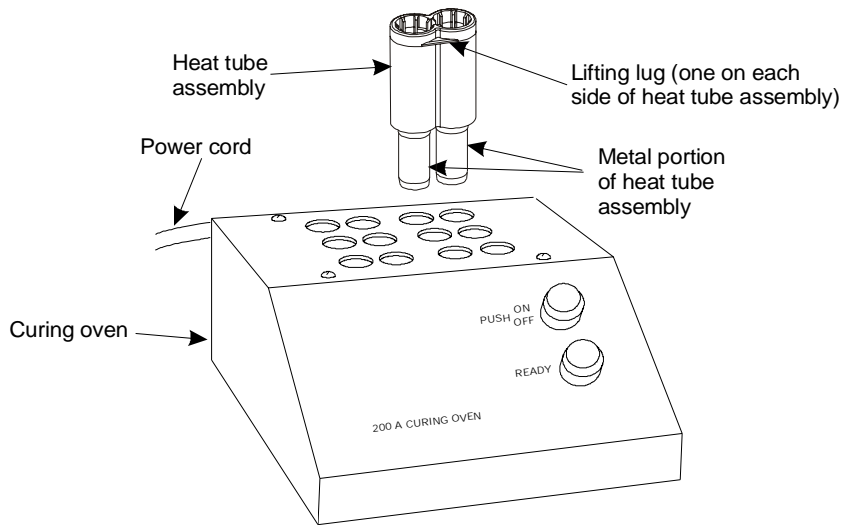
3. Oven Preparation

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 200A1 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.



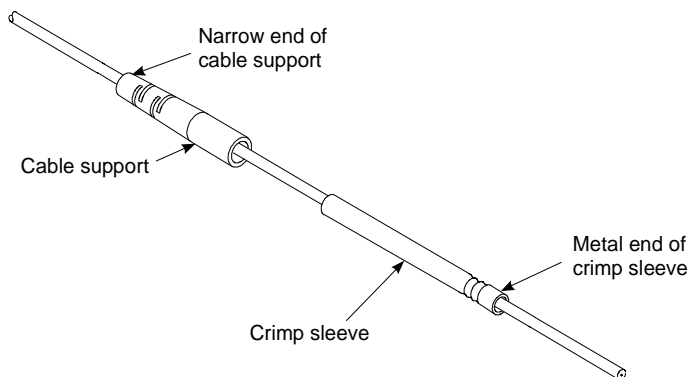
4. Cord Preparation

4.1 Assemble Connector Components (for 1.6, 2.0, or 3.0-mm Cordage)

Note: For 3.0-mm cordage, install the cable support, 3.0-mm crimp sleeve, and duplex clip (if needed), as shown in the figures below. The crimp sleeve does not have heat-shrink tubing attached. Make sure the duplex clip is oriented properly relative to the orange and blue buffered fibers, for duplex applications.

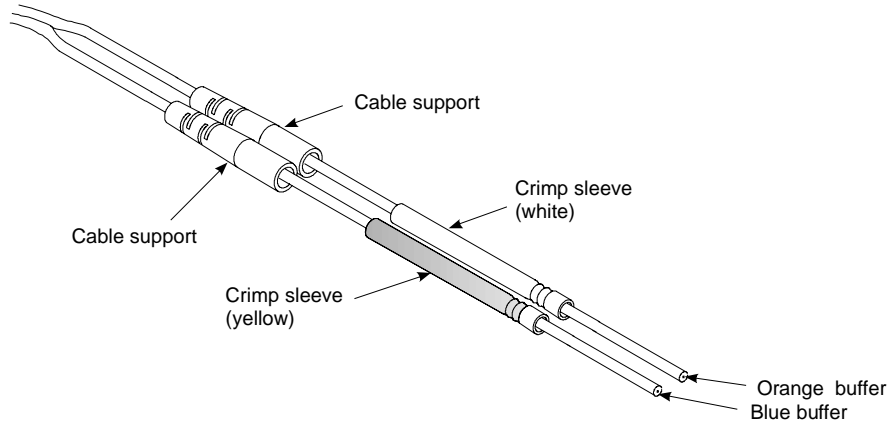
4.1.1 Simplex Applications on a Simplex Cord

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.



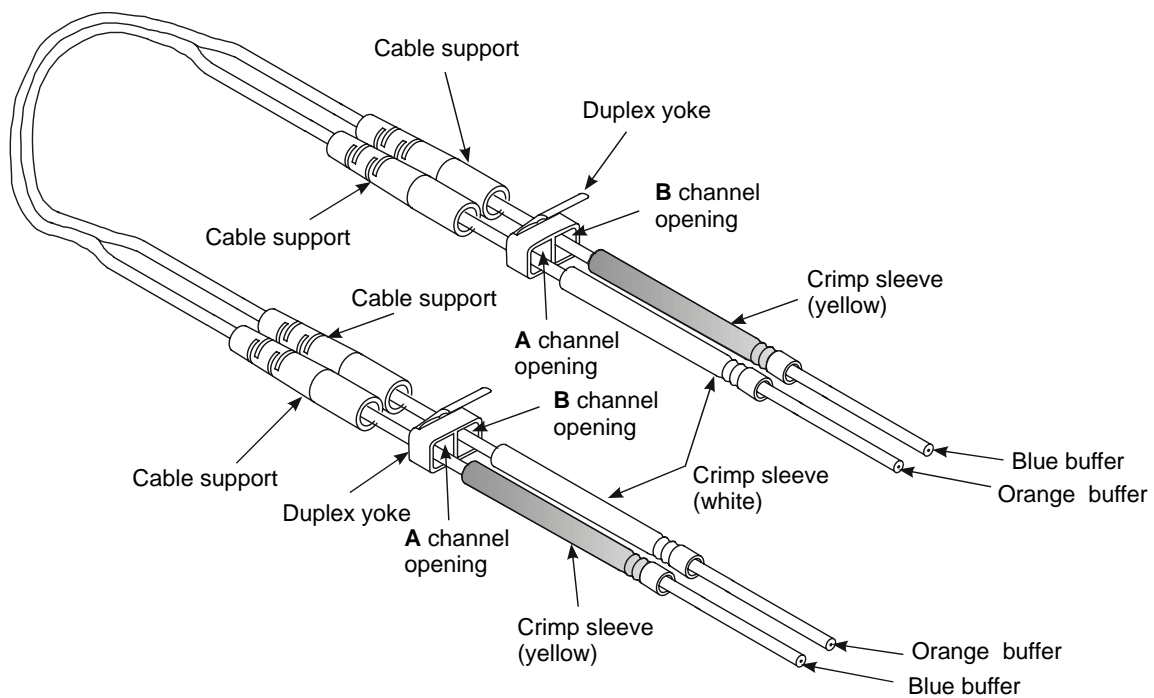
4.1.2 Singlemode Simplex Applications on a Duplex Cord

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.



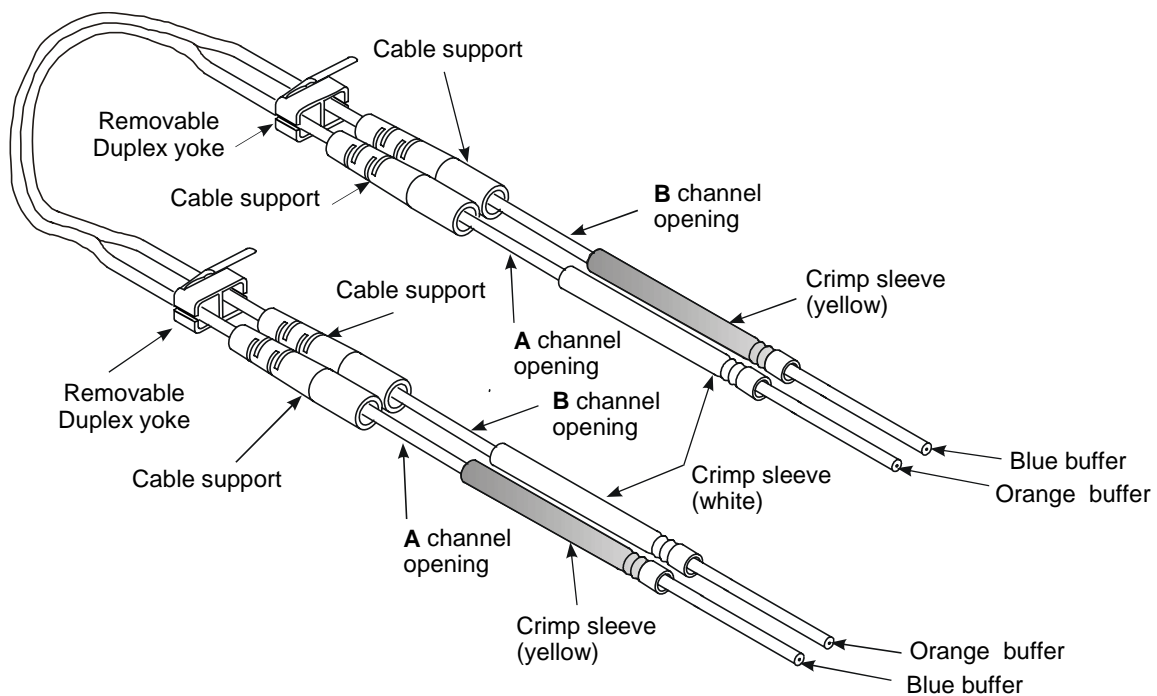
4.1.3a Duplex Applications on a Duplex Cord (with Regular Duplex Yoke)

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.



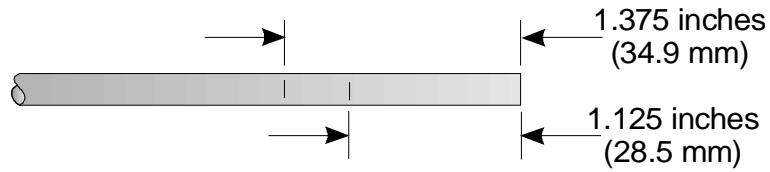
4.1.3b Duplex Applications on a Duplex Cord (with Replaceable Duplex Yoke)

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.

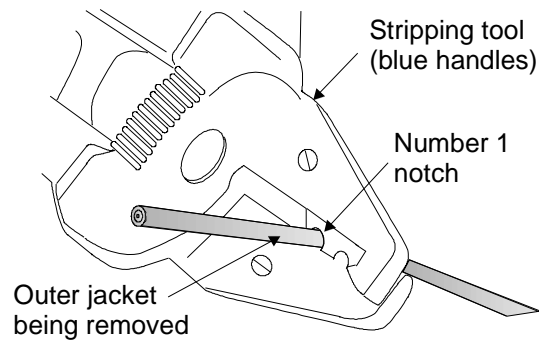


4.2 Remove Outer Jacket and Trim Strengthening Yarn

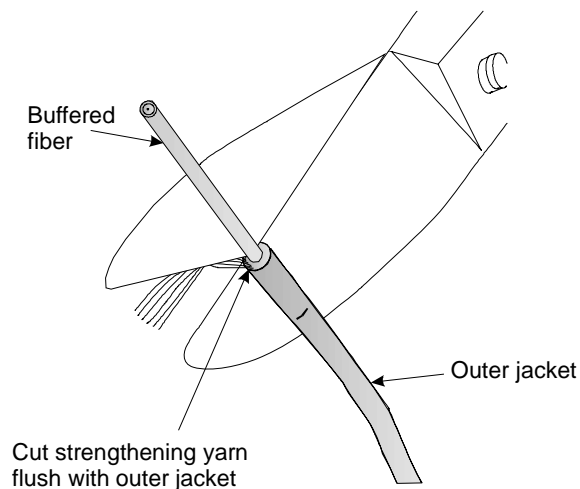
1. Locate the template and pen provided in the D-182959 Upgrade Kit (108 262 536).
2. Measure and mark outer jacket at 1.125 inches (28.5 mm) and at 1.375 inches (34.9 mm) from the end.



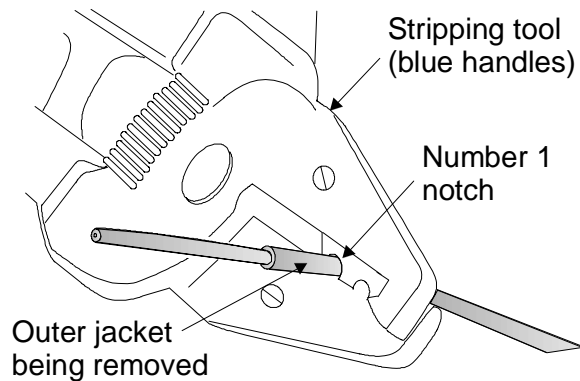
3. Use the 700A blue handle stripping tool to remove outer jacket at the 1.125 inches (28.5 mm) mark.



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



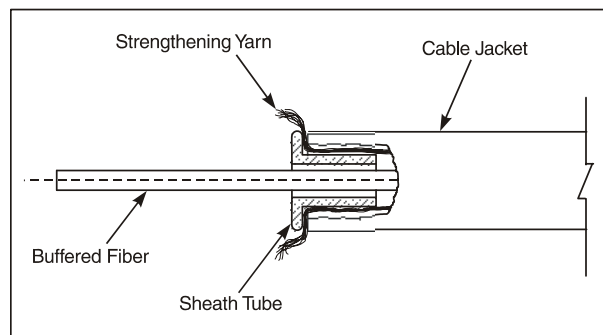
- Use the 700A blue handle stripping tool to remove outer jacket at the 1.375 inches (34.9 mm) mark. This will expose 0.25 inch (6.3 mm) of yarn.



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

Note: Steps 7 and 8 apply only when terminating 3.0-mm cordage.

- For 3.0-mm cordage, blow directly down the end of the cordage (axially), to separate the strengthening yarn from the buffered fiber. Compressed air can be used.
- Insert the sheath tube over the buffered fiber and into the cable jacket, making sure it is fully seated against the end of the cordage jacket.



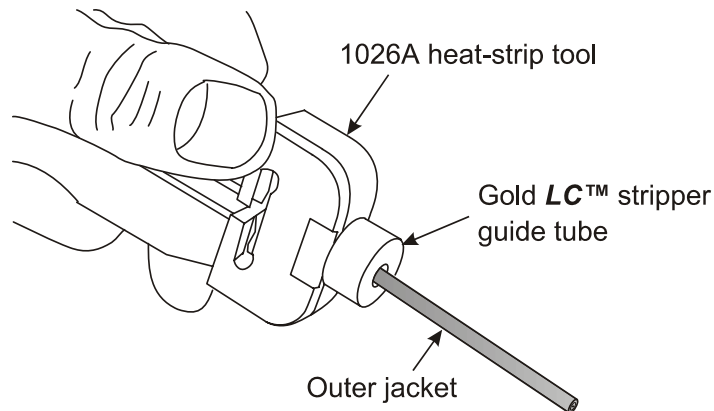
4.3 Remove Buffer and Fiber Coating

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

- 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).
- Locate the gold **LC** stripper guide tube (108 262 577) provided in D-182959 Upgrade Kit.
- Install the heat-strip tube into the heat-strip tool making sure the heat-strip tube is fully inserted into the heat-strip tool.
- Insert buffered fiber into the guide tube until the jacket and strengthening yarn (or sheath tube, if used) 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.

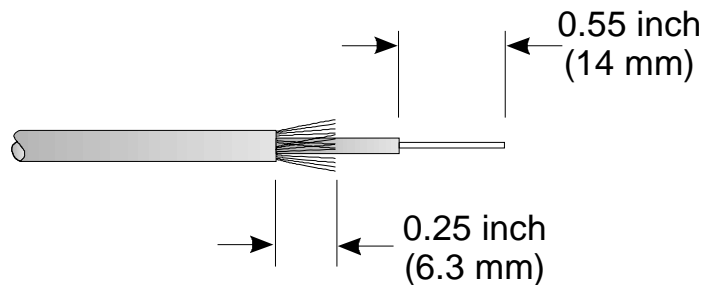
Caution: Proper stripping lengths and procedures are required for best connector pull-proof performance.



5. Close the handles of the heat-strip tool and wait 3 to 5 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. Verify strip lengths using the LC Cut-Length Template.

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 somewhat during connector plug assembly.

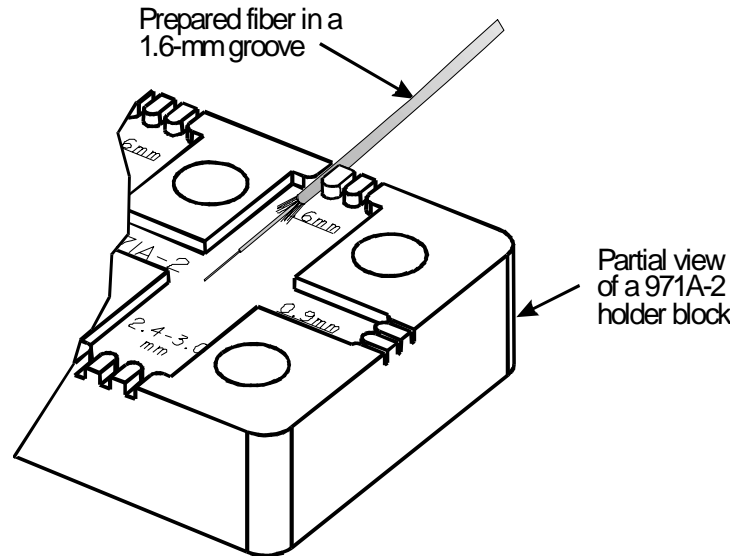


4.4 Clean Stripped Fiber

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 black holder block to avoid breaking or contamination of the fiber (holder blocks are provided in the D-182959 Upgrade Kit).



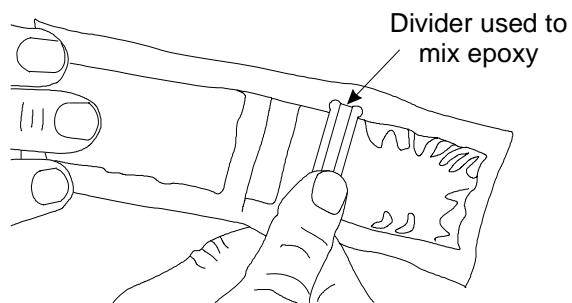
5. Epoxy Preparation

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. See ordering information in Section 10 of this manual.

Caution: Avoid contact of epoxy with skin.

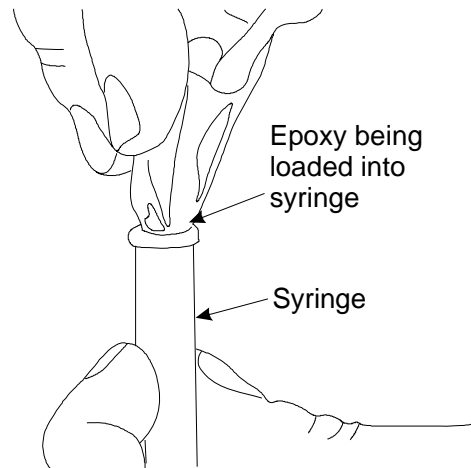
1. Remove the divider between the resin and the hardener.
2. Mix the epoxy using the divider.

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



3. Place the syringe tip on the syringe and twist to lock in place.
4. Remove the plunger from the syringe.
5. Fold the epoxy package in half and cut off one of the package corners.
6. Squeeze the mixed epoxy into the syringe.

Note: A 3/4-inch (19 mm) length of epoxy will be enough for about 50 connectors.



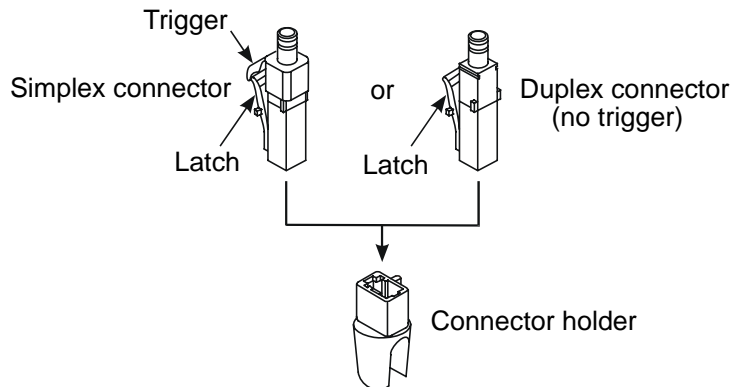
7. Replace the plunger into the syringe.
8. Remove air pockets from the syringe by holding the syringe tip upward and ejecting epoxy until the air pockets are removed.

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.

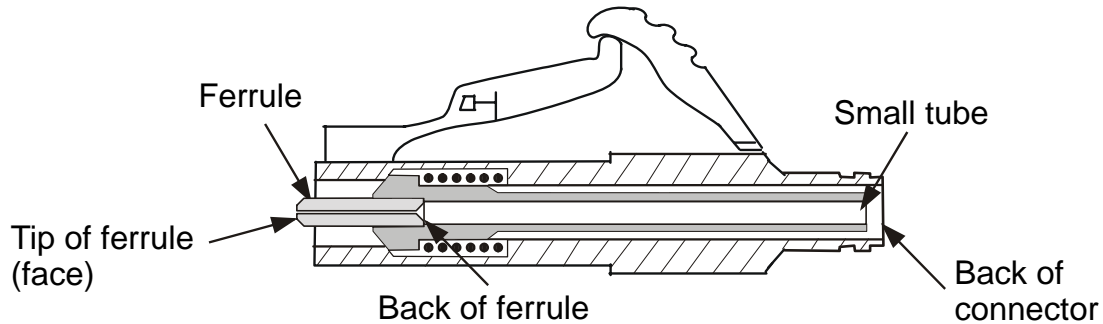


6.2 Apply Epoxy

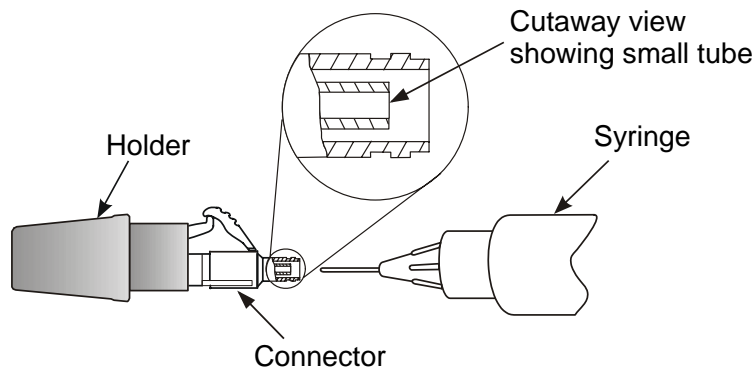
Epoxy is injected into two areas of the connector: (1) inside of the ferrule and (2) at the back of the ferrule. The syringe is first used to inject epoxy into the ferrule. This epoxy bonds the stripped fiber to the ferrule. Before removing the syringe from the connector, epoxy must next be deposited 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.

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



Note: Simplex connector shown.



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

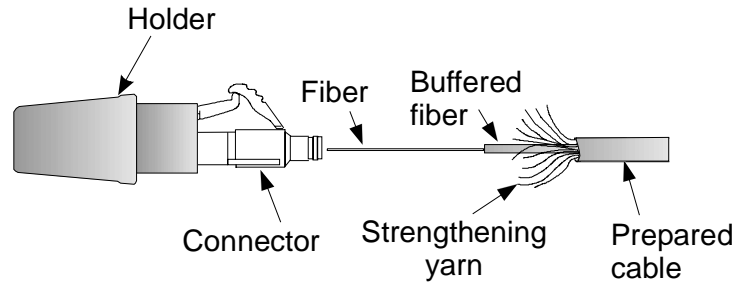
1. Remove prepared fiber from holder block.
2. Insert the exposed fiber into the small tube inside the connector and carefully feel for the opening in the ferrule.

Note: Rotating the fiber or the connector assembly may help to locate the opening.

Caution: Only perform the following step once.

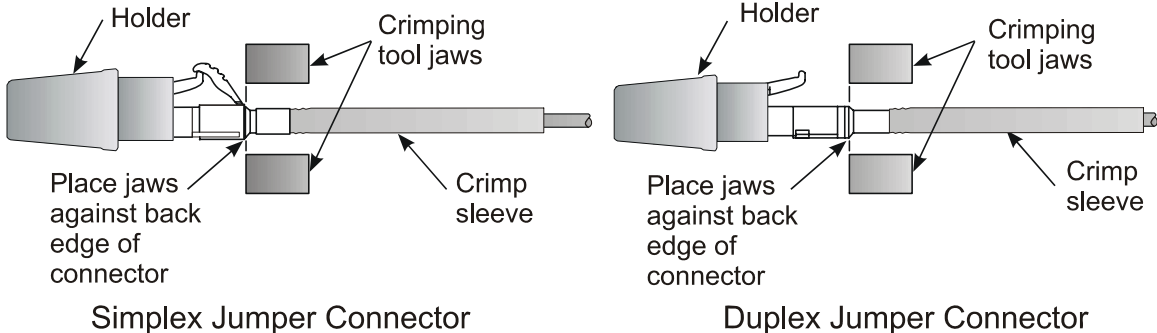
3. When the fiber is seated, pull it back slightly and watch for fiber movement at the tip of the connector to make sure the fiber is not broken.
4. Reposition the fiber back into the connector, making sure all of the strengthening yarn is outside the metal part of the connector body. If a sheath tube is present (i.e. for 3.0-mm terminations), the sheath tube should butt against the metal part of the connector housing.

6.4 Install Crimp Sleeve



1. Slip the cable crimp sleeve assembly over the back of the connector while capturing the strengthening yarn between the housing and the sleeve.
2. For 1.6 and 2.0-mm cordage termination, use the die cavity marked "LC" on the #2685 die set of the 1510LC Crimp Tool. Place the square edge of the connector against one edge of the crimp jaw with the crimp sleeve assembly lying through the crimp jaws.

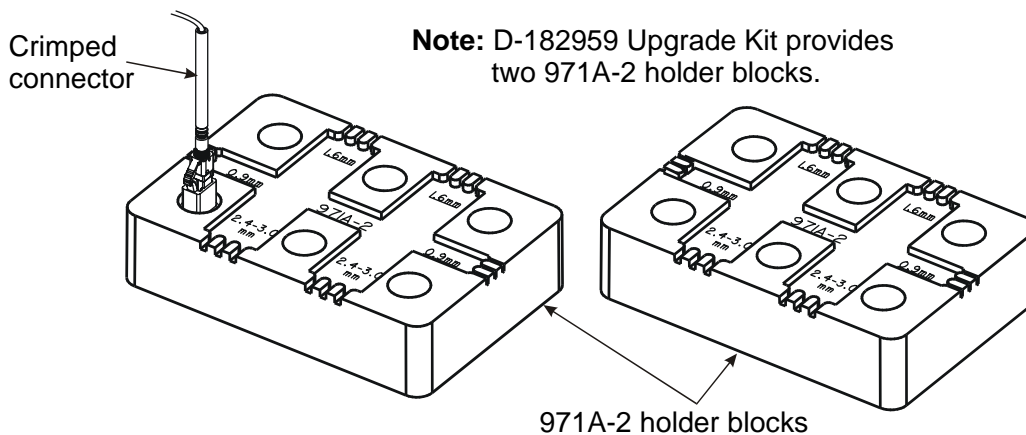
Caution: For 1.6 and 2.0-mm termination, crimping the crimp sleeve more than once can weaken the connector. **CRIMP ONLY ONCE.**



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

Note: For 3.0-mm cordage termination, use a 1510LC Crimp Tool for 3.0-mm (300 421 013), which is equipped with a #2652 die set. Use the hexagonal die cavity marked "0.128". **Center the die over the 3.0-mm crimp sleeve.** Crimp the sleeve once, rotate the connector 60 degrees and crimp the sleeve again, to insure a well-formed hexagonal crimp.

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.

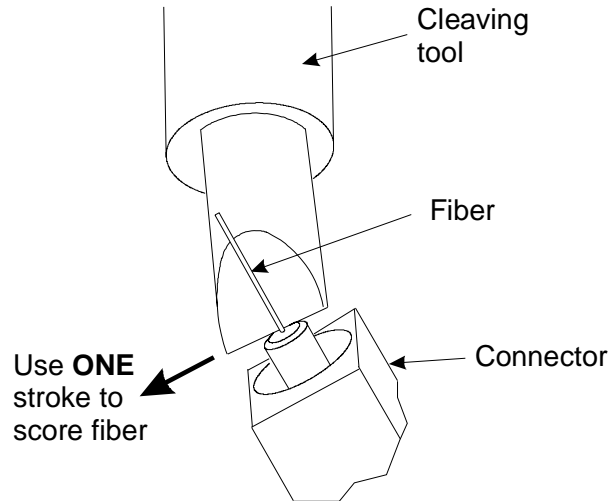
6.6 Cool Connector Assemblies

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 or 1032B6 Tool Kit.
Note: In the following step, score the fiber as close to the ferrule as possible, but be 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 connector.
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

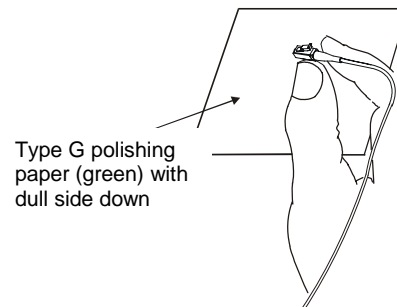
Caution: Contaminants on polishing materials can cause scratches on the end face of the fiber/ferrule. Throughout the entire polishing process, keep work area and all polishing materials clean.

Note 1: Table A provides a quick reference for polishing. The Universal Rubber Polishing Pad (300 472 644) must be used to insure acceptable optical performance and end-face geometry.

Step 1. Remove Fiber Stub

- In one hand, hold one sheet of Type G polishing paper (dull side down).
- 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.
- Air polish using light circular motions about 1 inch in diameter to carefully polish off fiber stub.



Step 2. Remove Excess Epoxy

- Use canned air to clean the back and front of a piece of Type G polishing paper (green).
- Saturate a wipe with isopropyl alcohol (>91% 2-propanol + water).
- Obtain a 5" diameter Universal Rubber Polishing Pad (300 472 644) and a T2001A Polishing Tool.
- Clean the (unmarked) shiny side of the rubber pad and the polishing tool with the saturated wipe.
- Use canned air to blow the rubber pad and polishing tool dry.
- Insert the **LC** connector into the T2001A polishing tool.
- Stack four, 3-mil mylar spacers (clear) on top of the rubber pad.
- Place the sheet of Type G polishing paper (green), dull side up, on top of the spacers.
- Gently place the polishing tool and connector onto the polishing paper.

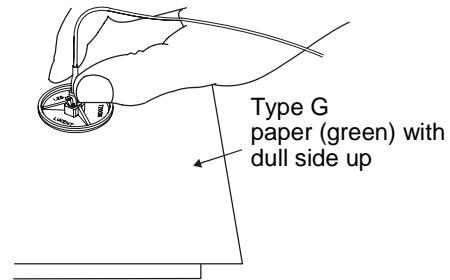
Note: In the following step, you should **not** feel any drag between the fiber and the paper. (If you do, repeat Step 1) Start with light pressure and use figure-8 strokes that are approximately 2 inches high and 1 inch wide. The figure-8 strokes must be well rounded to ensure complete removal of the epoxy from the end of the ferrule.

- i. Using moderate pressure, polish the connector for 45 figure-8 strokes. Move to an unused area of the paper for each connector being polished. Approximately six connectors may be polished on each sheet of Type G paper.

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.

- j. Using a 7X magnifier or **LC** microscope supplied in the D-182905 or D-182959 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 G polishing paper (green) to remove the excess epoxy. Also, be sure there is no epoxy on the beveled edge of the connector ferrule. Step 2 concludes the polishing procedure for multimode fibers. Step 3 is to be performed for singlemode fibers.



Step 3. Singlemode — Final Polish

- a. Remove the Type G paper and place a sheet of Type M paper (white) over the four mylar spacers (clear), on the rubber pad.

Note: Step 3 is critical for excellent return loss.

- b. Dampen the sheet with distilled water (do not flood). Remove the connector from the polishing tool and use the tool to spread the water over the paper using a few strokes.
- c. Place the connector back into the polishing tool and buff polish the connector using 10 figure-8 strokes, approximately 2 inches high and 1 inch wide, using moderate pressure.
- d. Clean fiber end with wipe dampened with water, then with a second wipe dampened with alcohol.

Table A. Polishing Overview

Step	Polishing Materials	No. of Figure-8 Strokes	Notes
1 (SM & MM)	Type G (green)	As Required	Air polish to remove fiber stub.
2 (SM & MM)	Type G (green) placed over four spacers (clear) over 5" dia. Rubber Pad (300 472 644)	45, then as required	Dry polish to remove epoxy.
3 (SM Only)	Type M paper (white) placed over four spacers (clear) over 5" dia. Rubber Pad (300 472 644)	10	Wet polish. Wet paper with distilled water.
Repair polish, only if needed	Type F (yellow) placed over four spacers (clear) over 5" dia. Rubber Pad (300 472 644)	5 strokes, then as required to remove flaw (10 strokes max)	Dry polish. For singlemode fibers, after flaw is removed, repeat Step 3

6.9 Repair Polishing (Only If Needed)

1. Place a sheet of Type F paper (yellow) over four spacers (clear) placed over the rubber pad.
2. Using firm pressure, polish the connector 5 strokes or until the flaw has been removed; however, do not exceed 10 strokes to avoid over polishing the connector. This concludes the repair procedure for multimode connectors. Repeat Step 3 in Section 6.8 for singlemode connectors.

Note: Type F paper (5 shts) is available as comcode 108601469.

6.10 Final Assembly

6.10.1 Simplex Connectors

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

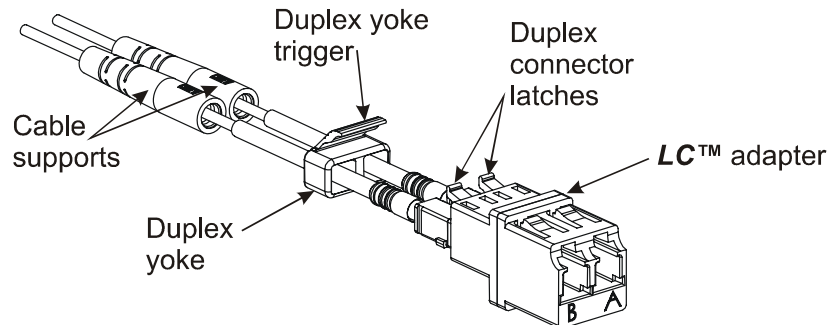
6.10.2a Duplex Connectors (with Regular Duplex Yoke)

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. 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.

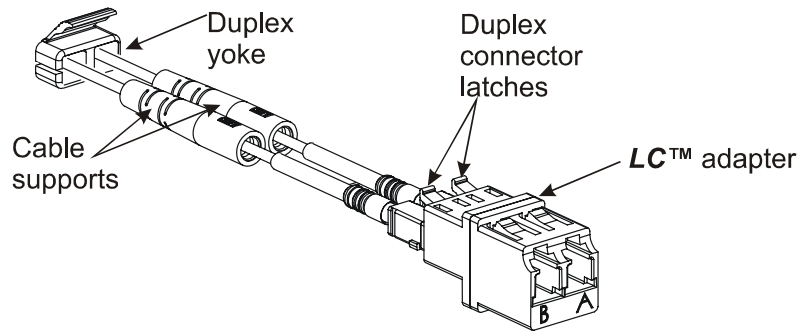
Note: The **LC** adapter is a temporary aid used in installing the final components of the connector assembly.

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

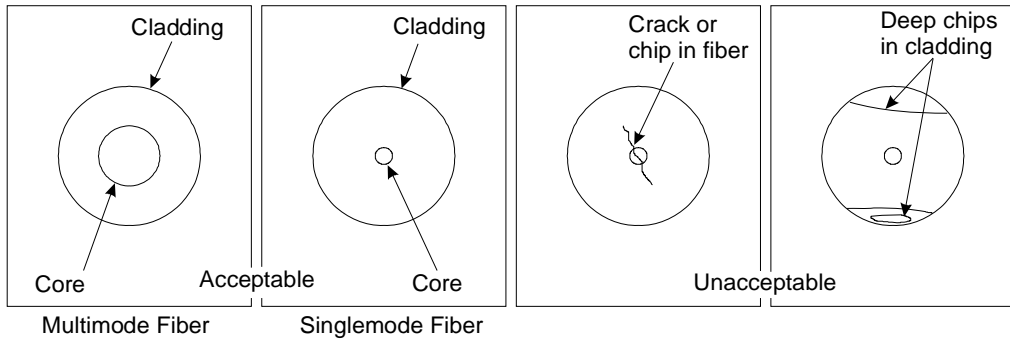
7.1 Fiber Inspection

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 B are for reference only and apply after all polishing procedures have been completed.

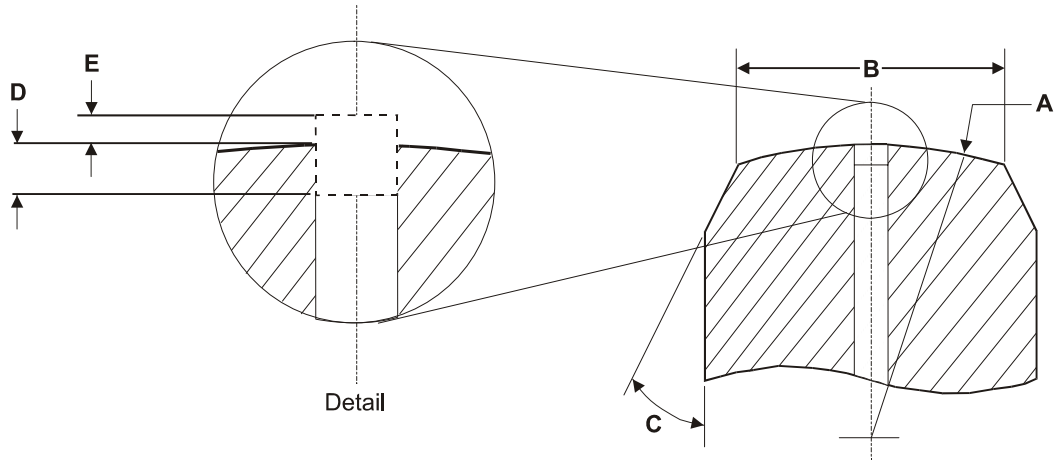
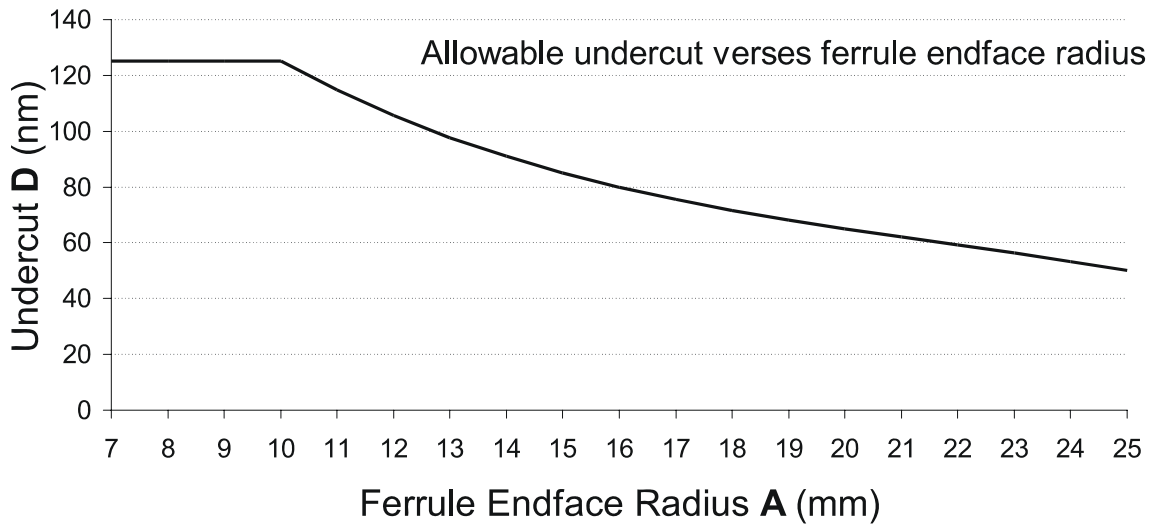


Table B. Recommended Singlemode Ferrule End Geometry (LC)

Item	Reference	Minimum	Nominal	Maximum	Dimensions
Radius	A	7	12	25	mm
Pedestal	B	0.65	--	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

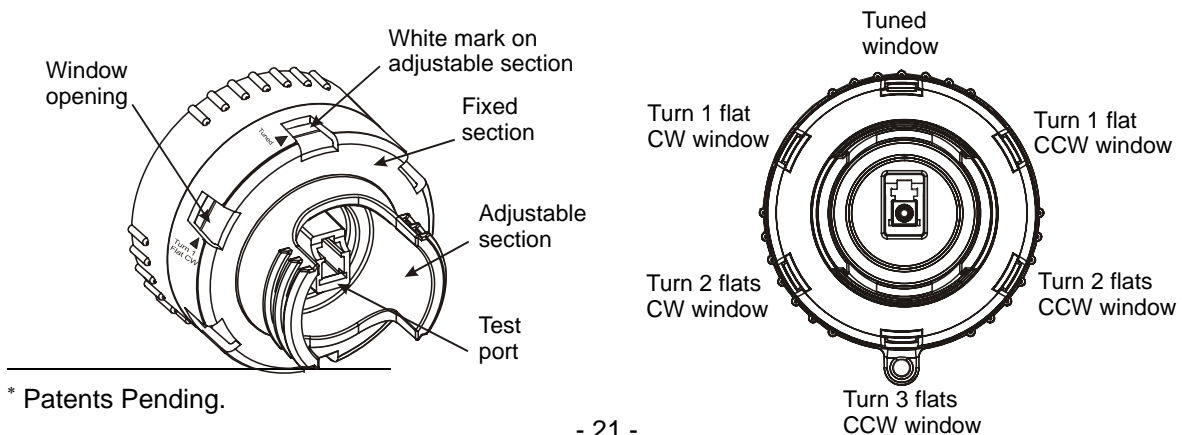
9.1 General Information

The D-183017 **LC** Tuning Kit*T (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.



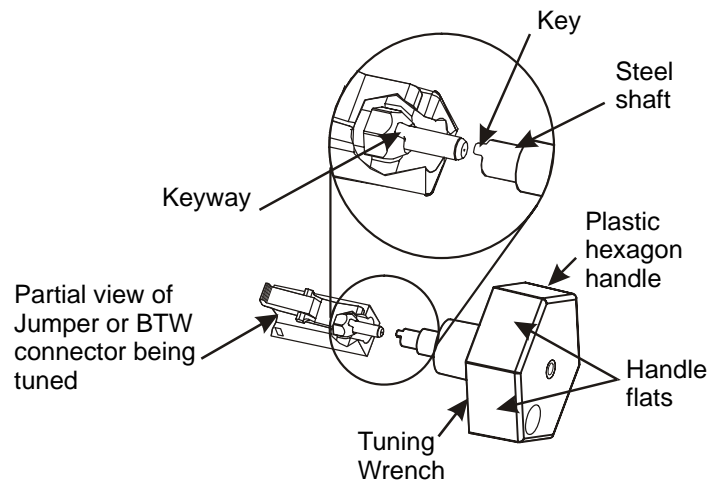
* Patents Pending.

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)].

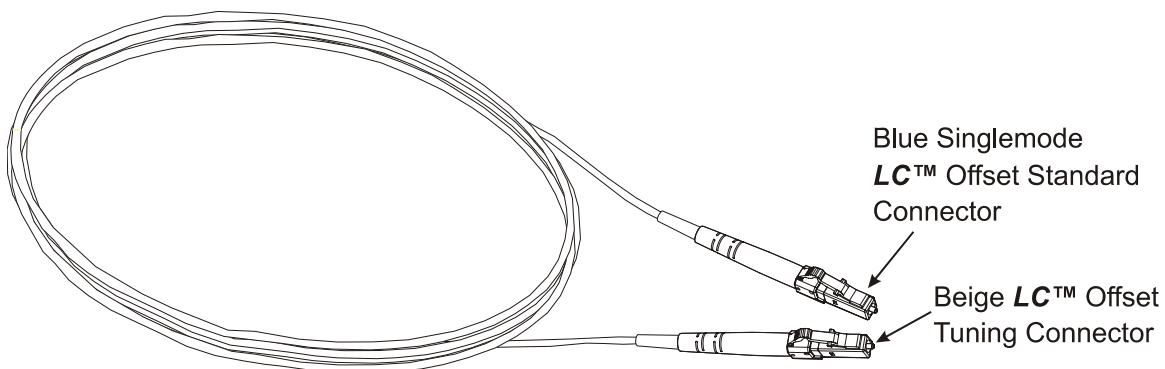
Caution 1: Damage will occur to the Tuning Wrench or the connector barrel/ferrule if the Tuning Wrench is rotated without the wrench being bottomed against the connector housing.

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.

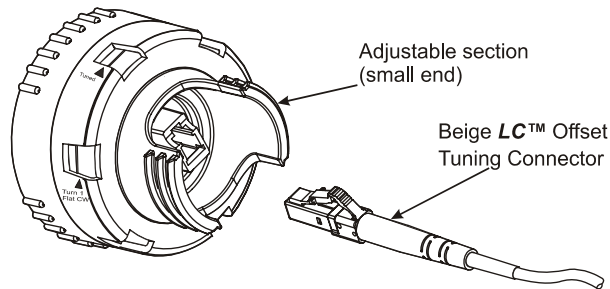
9.2 Safety Information

- 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.

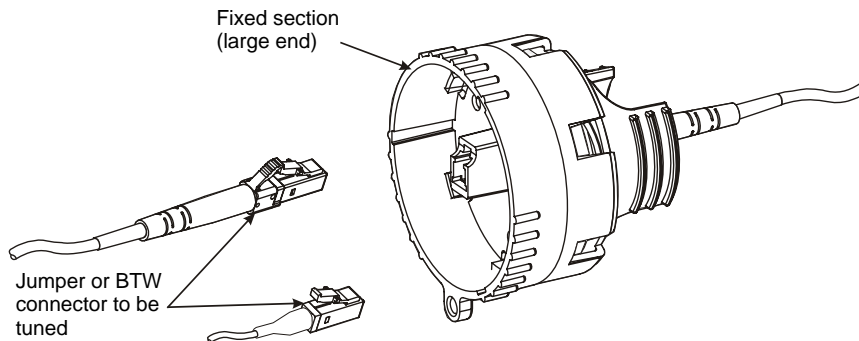
9.3 Tuning Procedure

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.

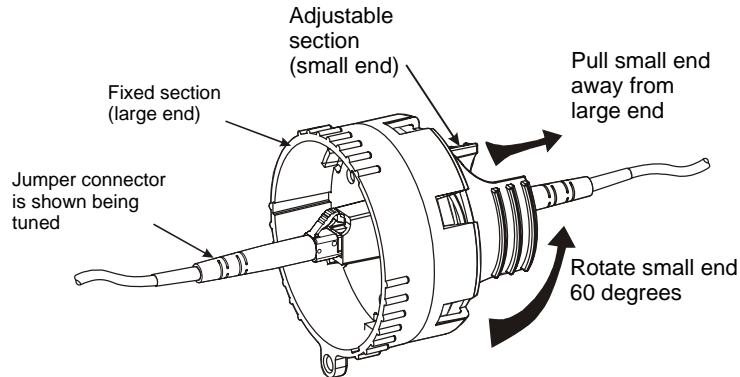


3. Make insertion loss measurement and record in the appropriate column on copied tuning sheet.

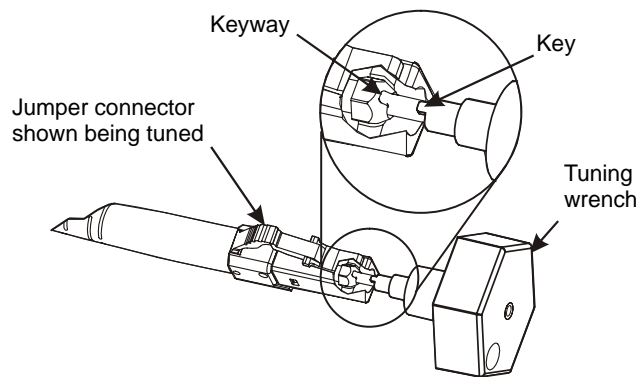
Note: It is not necessary to remove the tuning jumper or the jumper/BTW connector from the Tuning Index Tool until Step 10.

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						

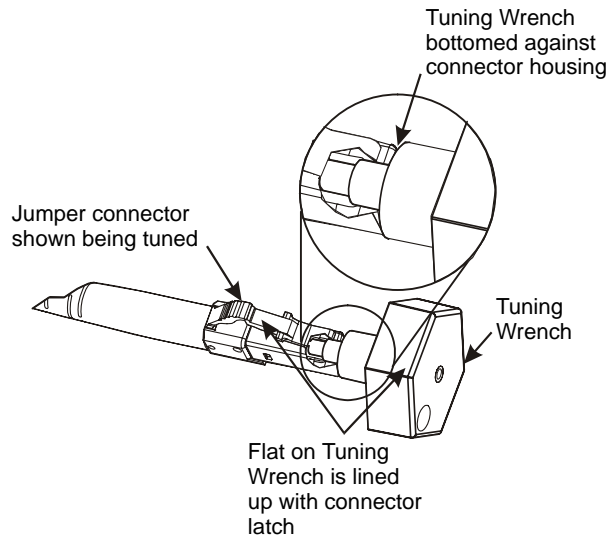
4. Grasp the small end of the Tuning Index Tool with one hand and large end of the Tuning Index Tool with the other hand.
5. Pull small end away from large end and rotate small end 60 degrees in clockwise direction.
 - Note 1:** It takes 3-4 pounds (0.9-1.8 kilograms) of force to separate the two halves 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.

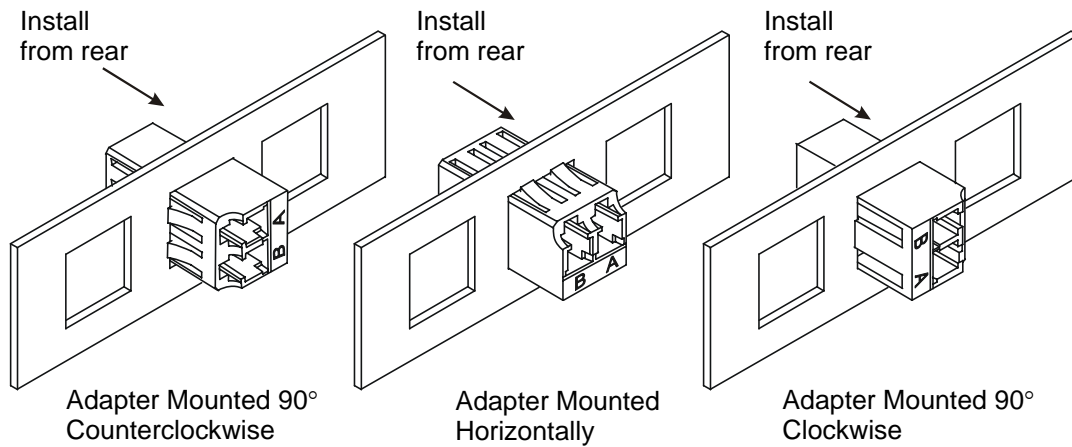
14. Hold connector stable and rotate the wrench the number of hex flats and in the direction determined in Step 9.
15. Remove the Tuning Wrench from connector.
Note: The jumper is now tuned per the measurements taken in Steps 3 through 7.
16. For a jumper, repeat this procedure for the connector on the 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.



11. Ordering Information

1032B5 Tool Kit (106 705 213) for SC and ST Connectors

Kit Quantity	Description	Replacement	
		Comcode	Quantity
1	1510B Crimping Tool	106 918 998	1 Tool
1	300B Microscope	104 412 077	1 Microscope
1	1510A1 Polishing Tool	108 237 710	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 (square)	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 [®] /SC Connectors Assembly Instructions – Epoxy and EZ Methods	See Note	1 Manual

Note: Obtain ST[®]/SC Connectors manual (640-252-044) from field support (1-888-342-3743).

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).

1510LC Crimp Tool (108 262 551) -- LC Crimp Tool for 1.6 and 2.0-mm cordage termination. This tool is equipped with a #2685 die set.

1510LC Crimp Tool for 3.0-mm (300 421 013) – LC Crimp Tool for 3.0-mm cordage termination. This tool is equipped with a #2652 die set.

3.0-mm Die Set for 1510LC Tool (300 506 391) -- Die Set #2652 for use with 1510LC Crimp Tool Handle

Universal Polishing Kit (300 472 651)

Note: Kit contains enough supplies to field polish 100 singlemode or multimode connectors.

Kit Quantity	Description	
1 Package	Wipes	
15 Syringes	Syringes	
25 Tips	Dispensing Tips	
20 Sheets	Type G Polishing Paper (green)	6 by 6 inches (152 by 152 mm)
10 Sheets	Type M Polishing Paper (white)	5" dia. disc (127 mm dia.)
5 Sheets	3-mil Mylar Spacer (clear)	6 by 6 inches (152 by 152 mm)

Universal Polishing Kit for Multimode Only (300 486 552)

Note: Kit contains enough supplies to field polish 100 multimode connectors.

Kit Quantity	Description	
1 Package	Wipes	
15 Syringes	Syringes	
25 Tips	Dispensing Tips	
20 Sheets	Type G Polishing Paper (green)	6 by 6 inches (152 by 152 mm)
5 Sheets	3-mil Mylar Spacer (clear)	6 by 6 inches (152 by 152 mm)

Universal Rubber Polishing Pad (300 472 644) -- one 5" diameter rubber polishing pad for polishing pre-radiused LC, SC, and ST connectors

Type G Paper (300 472 669)

Contains 20, 6"x6" sheets of (green) Type G Polishing Paper

Type M Paper (300 472 677)

Contains 10, 5" diameter sheets of (white) Type M Polishing Paper

Epoxy Kit (105 489 355)

Contains 15 bi-packs of Hysol 0151 heat curable epoxy.

Pre-radiused LC™ Connector Product Codes

Product Code	Description	Comcode	Package
P1000APR-127.0	MM Simplex Jumper Connector (1.6, 2.0 mm)	300 461 696	1
P1000APR-127.0-100	MM Simplex Jumper Connector (1.6, 2.9 mm)	300 473 113	100
P1002APR-127.0	MM Duplex Jumper Connector (1.6, 2.0 mm)	300 473 121	1
P1002APR-127.0-100	MM Duplex Jumper Connector (1.6, 2.0 mm)	300 473 139	100

P1002APR-127.0-1000	MM Duplex Jumper Connector (1.6, 2.0 mm)	300 471 109	1000
P1000BPR-127.0-1000	MM Simplex Jumper Connector (3.0 mm)	300 471 117	1000
P1002BPR-127.0-1000	MM Duplex Jumper Connector (3.0 mm)	300 471 125	1
P1100APR-126.0	SM Simplex Jumper Connector (1.6, 2.0 mm)	300 461 670	1
P1100APR-126.0-100	SM Simplex Jumper Connector (1.6, 2.0 mm)	300 473 147	100
P1100APR-126.0-1000	SM Simplex Jumper Connector (1.6, 2.0 mm)	300 471 133	1000
P1102APR-126.0	SM Duplex Jumper Connector (1.6, 2.0 mm)	300 473 154	1
P1102APR-126.0-100	SM Duplex Jumper Connector (1.6, 2.0 mm)	300 473 162	100
P1102APR-126.0-1000	SM Duplex Jumper Connector (1.6, 2.0 mm)	300 471 141	1000
P1100BPR-126.0	SM Simplex Jumper Connector (3.0 mm)	300 473 287	1
P1100BPR-126.0-100	SM Simplex Jumper Connector (3.0 mm)	300 473 170	100
P1100BPR-126.0-1000	SM Simplex Jumper Connector (3.0 mm)	300 471 158	1000
P1102BPR-126.0	SM Duplex Jumper Connector (3.0 mm)	300 473 188	1
P1102BPR-126.0-100	SM Duplex Jumper Connector (3.0 mm)	300 473 196	100
P1102BPR-126.0-1000	SM Duplex Jumper Connector (3.0 mm)	300 471 166	1000

LC™ Connector Accessories

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

D-183017 Singlemode Tuning Kit (108 476 094)

Qty.	Description	Replacement No.	
		Comcode	Quantity
1	LC™ SM Offset Test Jumper	108 476 110	1
1	LC Tuning Index Tool Assembly	108 476 151	1
1	LC 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).

Reference (Golden) Singlemode LC™ 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
MS1GLC-LC-5	SM Reference Jumper - LC Reference to Standard LC, Length 5 feet	108 513 045	1
MS1GLC-LC-10	SM Reference Jumper - LC Reference to Standard LC, Length 10 feet	108 513 052	1
MS1GLC-LC-15	SM Reference Jumper - LC Reference to Standard LC, Length 15 feet	108 513 060	1
MS1GLC-LC-20	SM Reference Jumper - LC Reference to Standard LC, Length 20 feet	108 513 078	1
MS1GLC-SC-10	SM Reference Jumper - LC Reference to Standard SC, Length 10 feet	108 513 086	1
MS1GLC-FC-10	SM Reference Jumper - LC Reference to Standard FC, Length 10 feet	108 513 094	1
MS1GLC-EP-10	SM Reference Jumper - LC Reference to Standard ST II+, Length 10 feet	108 513 102	1
MS1GLC-SCA-10	SM Reference Jumper - LC Reference to Standard Angled SC, Length 10 feet	108 547 860	1

Obtain Locally

- Distilled water.
- Isopropyl alcohol (>91% 2-propanol + water).
- Canned air (nonozone-depleting).
- Alternate epoxies: Locally obtained epoxies with shorter shelf life and higher T_g for outside plant use are acceptable alternates, such as:

EPO-TEK* 353ND adhesive
 Manufacturer:
 Epoxy Technology, Inc.
 14 Fortune Drive
 Billerica, MA 01821
 Phone: 1-800-227-2201

Tra-Bond** F123MV adhesive
 Manufacturer:
 Tra-Con, Incorporated
 45 Wiggins Avenue
 Bedford, MA 01730
 Phone: 800-TRA CON1

12. Assistance Information

For more information, contact your OFS Sales Representative.

For fiber optic technical assistance, call 1-888-FIBERHELP (1-888-342-3743).

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

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