7.1 Cleaning

The following procedures are for cleaning terminus and connector end faces that have surface contamination, debris or dirt:

Step 1 - Use a lint free wipe moistened with 99% reagent grade isopropyl alcohol or optical quality cleaning fluid to clean the end face. Always wipe in one direction not back and forth.

Step 2 - Re-inspect the terminus and or connector end face with the Fiber Optic Video Probe or a hand held Fiber Optic Microscope and verify that the contamination has been removed.

CAUTION

Use of canned air can cause oily deposits on the ferrule end face. Clear the nozzle by pre-spraying the canned air prior to spraying the ferrule end face. Use of propellant-free canned air, designed for fiber optics maintenance, is preferred.

Step 3 - If the contamination is still present then repeat Step 1 and then use canned air to blow off the end face of the terminus and or connector.

Step 4 - If the contamination is still present, after repeated attempts to clean the end face have failed, then proceed to paragraph 9.1 for re-polishing procedures.

7.2 Inspection

7.2.1 Physical Contact (PC) Connectors

WARNING

Serious eye injury can occur if viewing actively transmitting connectors in handheld fiber optic microscopes. Always verify that the connector under inspection is not attached to a transmitting source.

The visual end face inspection of terminus and or connectors can be accomplished using either the Fiber Optic Video Probe or a hand held Fiber Optic Microscope.

Step 1 - Verify that the fiber link to be examined is not actively transmitting. This is accomplished by using an infrared detection card and by physically detaching the connectors from the transmitters. Also a visible white light or VFL red light source can be used to verify continuity of the fiber link under examination.

Step 2 - Using the Fiber Optic Video Probe or a hand held Fiber Optic Microscope inspect the terminus and or connector end face for contamination, chips, pits, scratches and shatters in the core and the inner two thirds of the cladding. See Figures 7-1 through 7-7.

Step 3 - If dirt, debris or other surface contamination is identified then proceed to Section 7.1 for cleaning procedures. If minor scratches, chips or pits are identified then proceed to paragraph 9.1 for re-polishing procedures.

Note: White light (i.e., from a flashlight or other source) may have to be launched into the opposite end of the optical fiber cable to illuminate the core when inspecting for core cracks (Zone A).

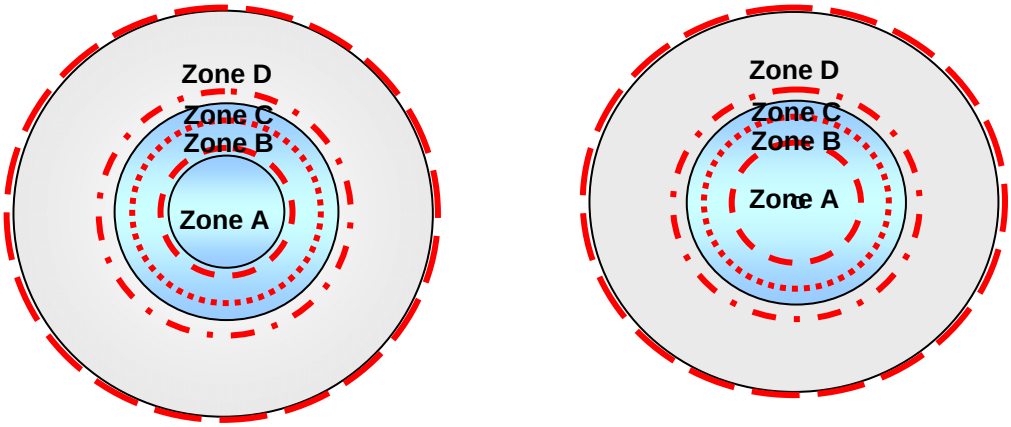


Figure 7-1 – Allowable Visual Inspection Criteria for Multimode and Single-mode Optical Fiber End Face

Visual Inspection Criteria	Zone A Core/Mode Field Area	Zone B Core/Cladding Area	Zone C Bond Line Area	Zone D Ferrule Area
Cracks	None >1µm	Maximum of 5 Cracks ≤5µm	No Limit of Size or Number	None
Chips	None >1µm	Maximum of 5 Chips ≤5µm	No Limit of Size or Number	None >10µm
Scratches	None >1µm in Width No Limit on Number of Scratches	None >3µm in Width No Limit on Number of Scratches	No Limit of Size or Number	No Limit of Size or Number
Pits	None ≤ 1µm in Diameter	Maximum of 5 Pits ≤5µm	No Limit of Size or Number	No Limit of Size or Number
Debris	Maximum of 5 Pieces of Debris ≤ 1µm in Diameter	Maximum of 5 Pieces of Debris ≤ 1µm in Diameter	Maximum of 5 Pieces of Debris >10µm in Diameter	Maximum of 5 Pieces of Debris >10µm in Diameter

Table 7-1 Allowable Visual Inspection Criteria for Multimode and Single-mode Optical Fiber End Face

Specific examples of various observable features and their acceptance/failure status can be found in Figures 7-2 through 7-6.

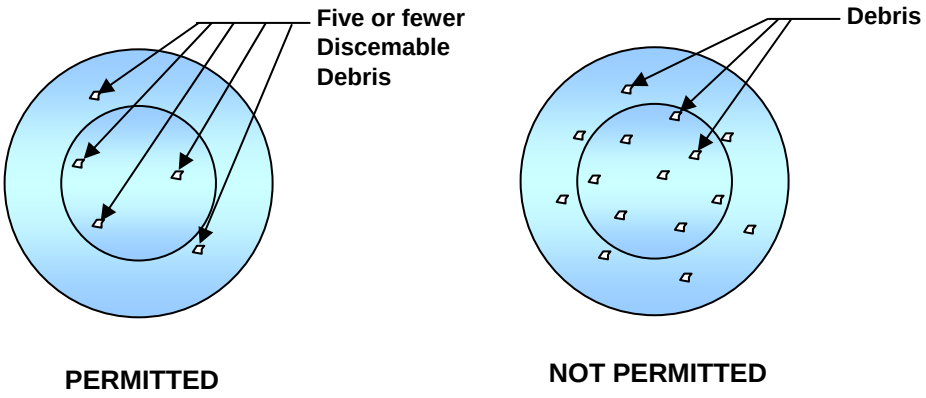


Figure 7-2 – Particle Contamination of the End Face of an Optical Fiber

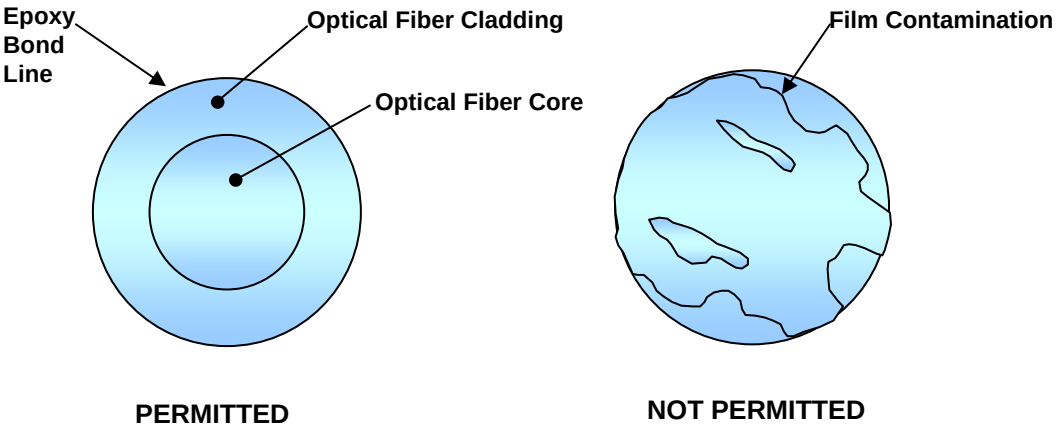
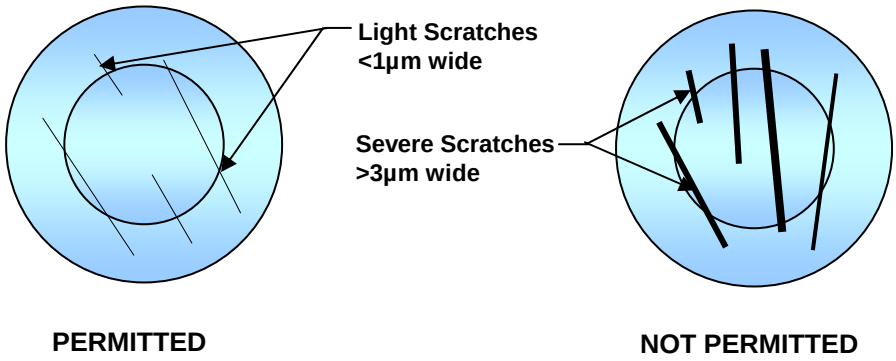


Figure 7-3 – Film Contamination of the End Face of an Optical Fiber



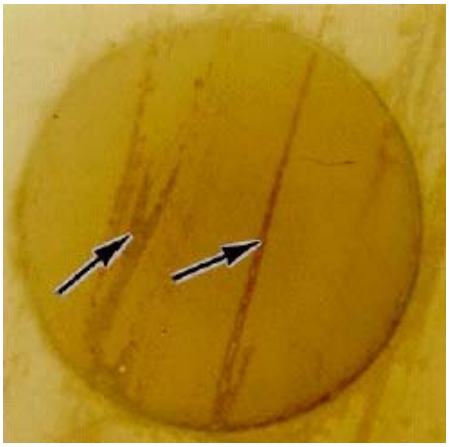


Figure 7-4 – Scratches on the End Face of an Optical Fiber

7.0 MAINTENANCE

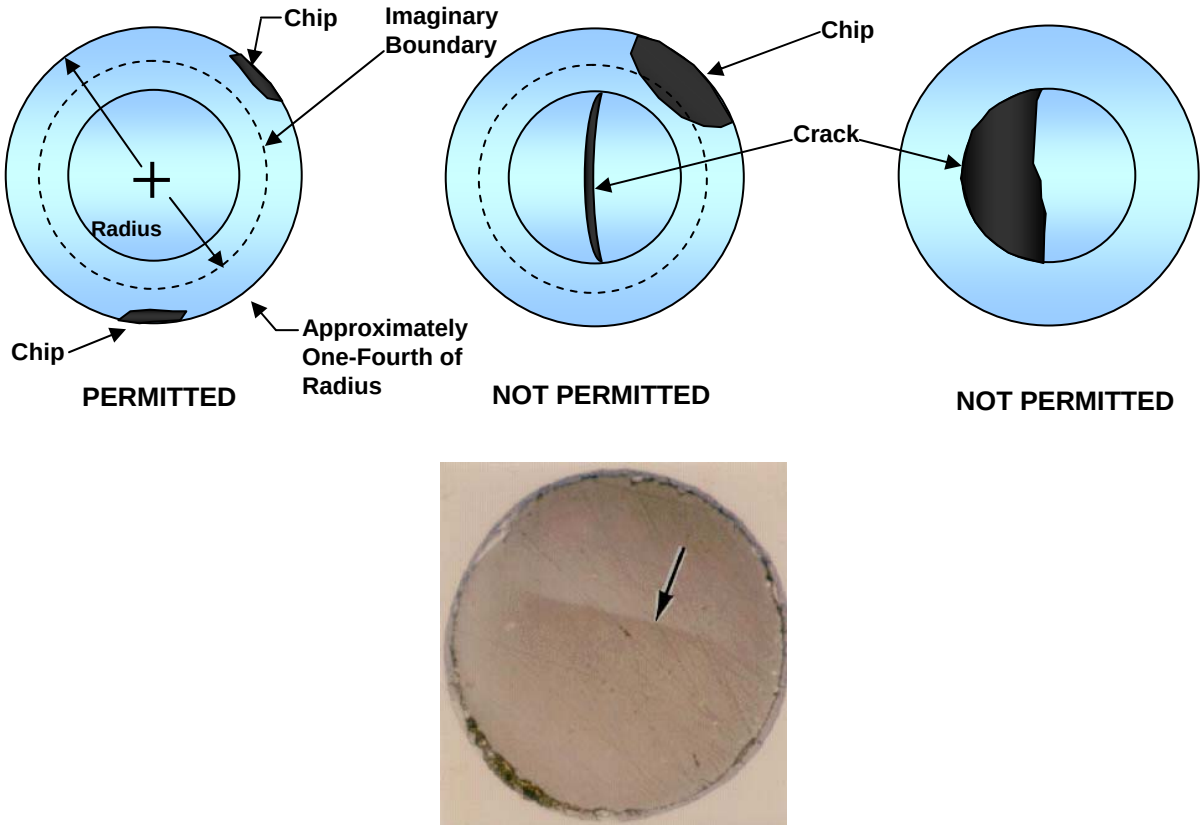


Figure 7-5 – Cracks on the End Face of an Optical Fiber

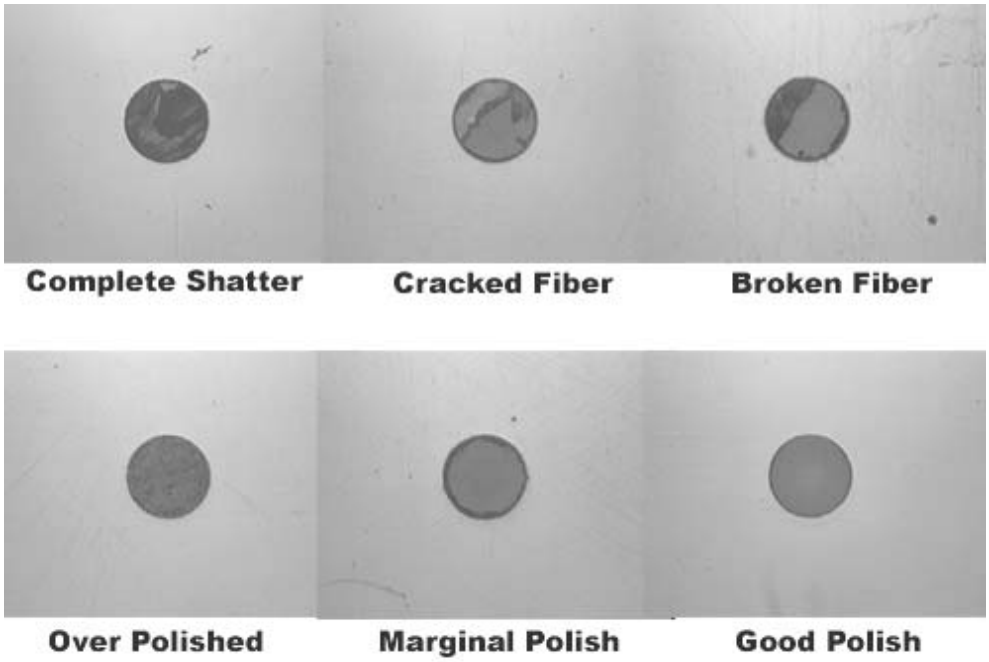


Figure 7-6 – Visual Acceptance Criteria for Connectors at 200x Magnification

Note: When printing the above photos from the electronic version of this document, a high-resolution printer should be used.

7.2.2 Expanded Beam Connectors

Where required, connector disassembly to expose the optical end face should be accomplished with standard tools per the manufacturer's procedure.

If necessary, inspection of the optical end face should be performed with an eye loupe with 10x magnification. The lens or protective window should not be damaged. As shown in Figure 7-7, the optical interface should be free of pits, scratches and contamination.

The connector end-faces should be cleaned per the manufacturer's recommended procedure. Where chemicals or solvents are required, the materials should be pure, reagent grade.

Step 1 - Moisten the tip of a clean lint-free wipe with quality optical cleaning solution, then using a back-and-forth or swirling motion, wipe the lenses with the swab. To remove any remaining optical cleaning solution or stray particles, either wipe the optical face with a clean, dry lint free wipe (or swab) or blow clean dry canned air over the lenses. Re-inspect with10 x magnifier to make sure that all contamination is removed. Finally, re-install protective cap or re-connect immediately. See Figure 7-7.

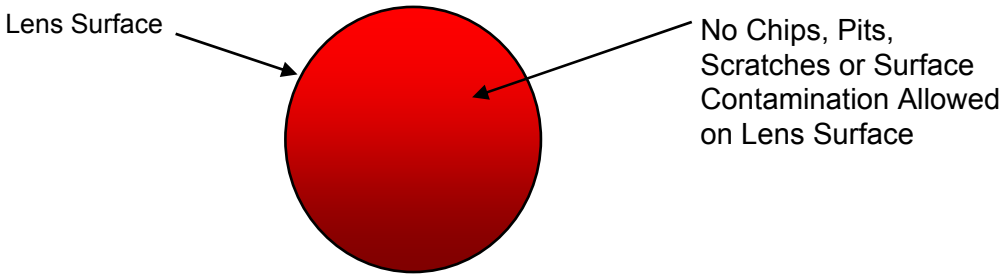


Figure 7-7 – Visual Acceptance Criteria for Expanded Beam End Face at 10x Magnification

7.3 Testing

7.3.1 Continuity Testing

Continuity testing is a simple test procedure utilizing a white light source. An optical flashlight, which is modified to more efficiently couple white light into the fiber optic cable, is used to verify the correct fiber link and to give an initial visual indication that the cable is not broken. This is by no means intended to indicate that the fiber link has been successfully tested and is capable of performing properly within the fiber link. The optical white light source is attached to the connector on one end and the white light should be visible at the connector on the opposite end of the same fiber link. When performing continuity testing on single mode cables the white light may be difficult to see due to the extremely small core size. The single-mode connector may have to be cupped within your hand, in order to see the arriving light of the connector under test. Additionally a Visual Fault Locator (VFL) may be used instead of an optical white light source.

WARNING

Never view the VFL emissions directly, only indirect viewing is safe to the eye.

7.3.2 Visual Fault Locator (VFL) Testing

The VFL is useful for continuity testing, identifying cables that exceed their minimum bend radius, damaged connectors and for identifying broken cables. The VFL is designed to be attached directly the connector ferrule and the visible red class II laser light is coupled into the fiber. Use caution when viewing the emitted visible laser light. Never directly view the emitted laser light.

7.4 Termination Procedures

7.4.1 Terminus Installation Procedures

COMMENTARY

There are several approved epoxies for aerospace fiber optic applications. The cure temperature and cure schedule must be properly identified prior to performing any fiber optic terminations.

There are three types of aerospace cables used in the termination of ARINC 801 termini. The three different types are called simplex cable, double strength simplex cable, and multiple fiber cables. The simplex cable is described as a 62.5/125/250µm single optical fiber with strength members surrounded by a single outer cable jacket. The double strength simplex cable is described as a 62.5/125/250µm simplex optical fiber surrounded by barrier braid with an overall cable jacket. The multiple fiber cable is described as multiple 62.5/125/250µm simplex cables surrounded by barrier tape with an overall cable jacket.

The following sections detail the termination process for simplex cable, double strength simplex cable and multiple (dual) fiber cable types.

7.4.2 801 LM, 801 LS, 801 TM, and 801 TS Terminus Assembly

This termination method is for placing 801 LM, 801 LS, 801 TM, and 801 TS termini onto the end of a loose or tight structure fiber optic for simplex, double strength simplex, and a dual fiber cable. The 801 LM and 801 TM termini are used with circular multi-terminus connectors, EPX Series connectors, and ARINC 404 and 600 series connectors.

CAUTION

Throughout the termination process, cleanliness is critical to obtaining a high optical quality connector. Make sure that your hands and the work area are as clean as possible to minimize the ingress of dirt into the connector parts.

Note: Verify that the epoxy shelf life has not expired. Do not use epoxy with an expiration date that has passed.

a. Safety summary. The following safety precautions should be observed:

(1) Safety glasses should be worn at all times when handling bare fibers or dispensing epoxy.

(2) Do not touch the ends of the fiber as they may be razor sharp. Wash your hands after handling bare fiber.

(3) Avoid skin contact with epoxies.

(4) Do not stare into the end of a fiber until verifying that the fiber is not connected to a laser light source or LED.

b. Cable and fiber preparation.

CAUTION

Use caution when stripping the buffer material on short cable assemblies. The fiber can be accidentally pulled out from under the cables outer jacket. To prevent the fiber from being pulled out, carefully wrap the cable around your hand when stripping the buffer material.

Note: To reduce the effects of cable shrinkage, it is recommended to cut the cable +51 mm (+2.00 in) longer than the final cable assemblies length and let the cable rest for a 24 hour period prior to terminating.

Note: There are two types of termini described in the following termination procedures. It is critical to use the proper termini with the correct type of fiber optic cable. “Tight” Structure cable must utilize the “Tight” structure termini and “Loose” Structure cable must utilize the “Loose” Structure termini. See Figure 7-8.

801 LM/LS Terminus **801 TM/TS Terminus**

Figure 7-8 – 801 TM/TS Termini and 801 LM/LS Termini

Note: The three types of cable preparations are broken down into 3 subset paragraphs; P1 is for cable preparation for the dual fiber cable, P2 is for cable preparation for the double strength simplex cable, and P3 is for the cable preparation procedures. It is essential to follow the correct cable preparation procedures for the type of cable being utilized.

Note: Perform steps in section P1 for cable preparation for the dual fiber constructed aerospace cables. Proceed to section P3 to continue termination procedures.

P1. Dual Fiber Cable Preparation Procedures

Step 1 - Mark the outer jacket of the dual fiber cable jacket to 92-93mm (3.62-3.66 in). See Figure 7-9.

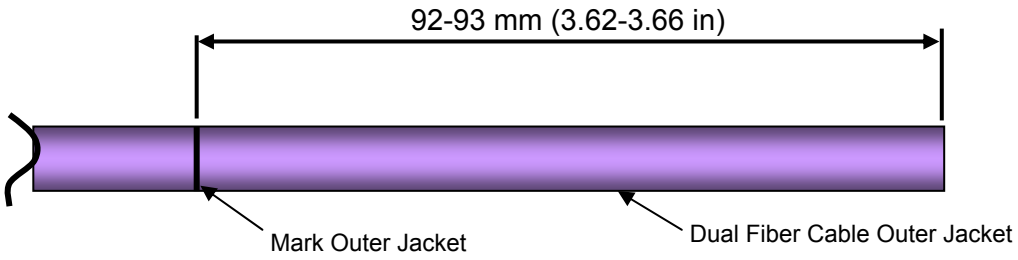


Figure 7-9 – Marking the Outer Jacket of the Dual Fiber Cable

CAUTION

Use caution when cutting the dual fiber outer cable jacket. Do not cut into the two optical fibers underneath the outer cable jacket.

Step 2 - Carefully cut and remove the dual fiber cable outer jacket back to the mark using hot tweezers. See Figure 7-10.

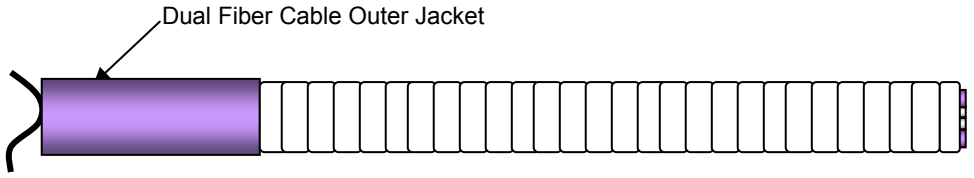


Figure 7-10 – Removing the Dual Fiber Outer Cable Jacket

Step 3 - Carefully unwrap the barrier tape back to the dual fiber cable outer jacket and cut flush with the outer jacket. Next cut the two filler rods flush with the cable's outer jacket. See Figure 7-11.

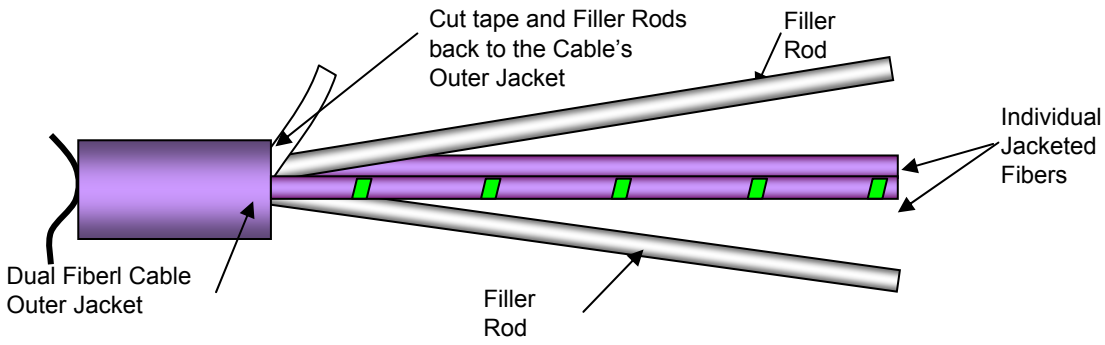


Figure 7-11 – Cutting Back the Tape and Filler Rods

CAUTION

Use caution when shrinking down the heat shrink. Excessive heat can cause damage to the outer jacket of the optical cable.

Step 4 - Slide the yellow heat shrink, part number M23053/5-104-4, 25mm +/- 2.5mm (1.00 in +/- 0.10 in) long up onto the individual jacketed optical fiber with the yellow tracer embedded in the strength members. Slide the green heat shrink, part number M23053/5-104-5, 25mm +/- 2.5mm (1.00 in +/- 0.10 in) long up onto the individual jacketed optical fiber with the green tracer embedded in the strength members (cable with the green strips on the outer jacket). Ensure that the heat shrink goes up to and touches the outer jacket of the dual fiber cable. Shrink down the heat shrink using a heat gun no hotter than 210ºC. See Figure 7-12.

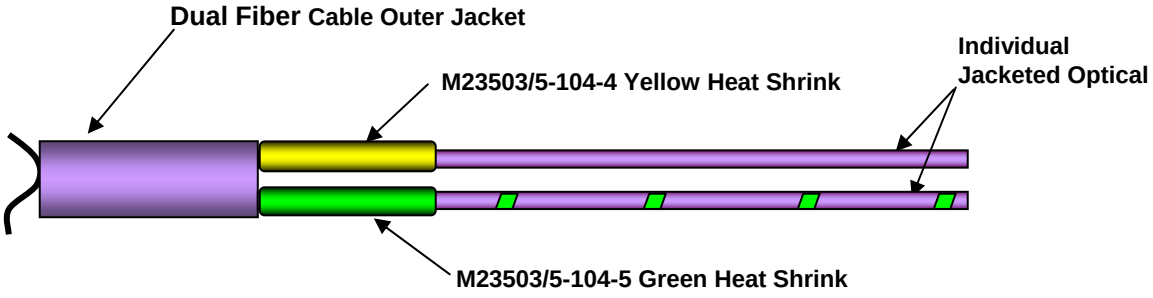


Figure 7-12 – Installing the Yellow and Green Heat Shrink Sleeves

Step 5 - Slide the black heat shrink, part number DWP-125 3/8-0, 38mm +/- 2.5mm (1.50 in +/- 0.10 in) long up onto the outer dual fiber cable jacket. There should be approximately 3.2mm (0.125 in) of the yellow and green heat shrink exposed from under the black heat shrink. See Figure 7-13.

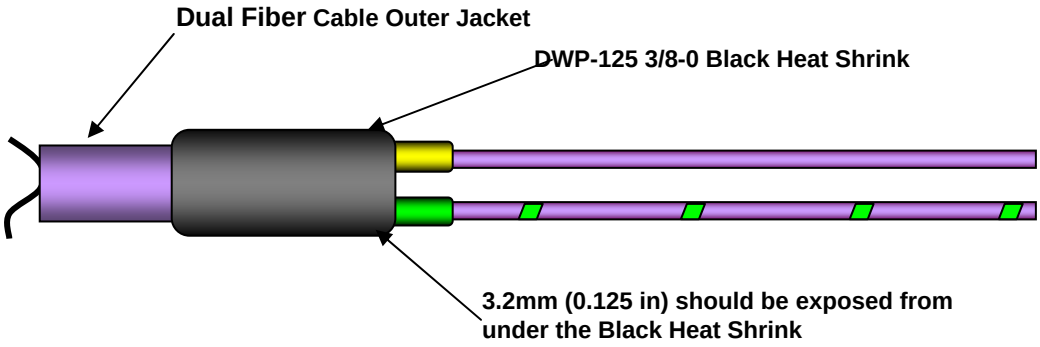


Figure 7-13 – Installing the Black Heat Shrink Sleeve

Step 6 - Shrink down the black heat shrink sleeve using a heat gun no hotter than 210ºC. While the heat shrink is still hot take a pair of needle nose pliers or tweezers and pinch the black heat shrink sleeve between the yellow and green heat shrink sleeves to seal the juncture. See Figure 7-14.

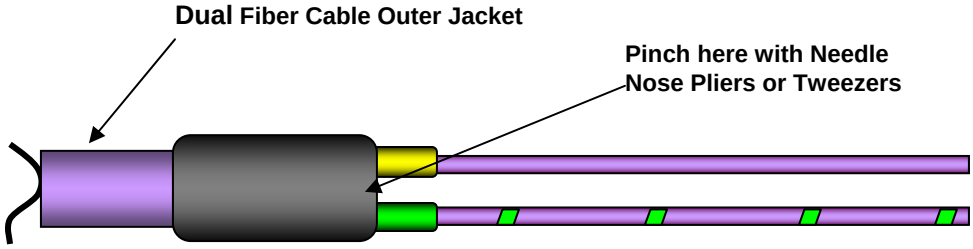


Figure 7-14 – Shrinking Down the Black Heat Shrink Sleeve

Step 7 - Proceed to section P3 to continue with the termination procedure.

Note: If termination is on dual fiber cable, make sure to install a crimp sleeve on each individual jacketed optical fiber.

P2. Double Strength Simplex Cable Preparation Procedures

Step 1 - Mark the outer jacket of the double strength simplex cable jacket to 92-93mm (3.62-3.66 in). See Figure 7-15.

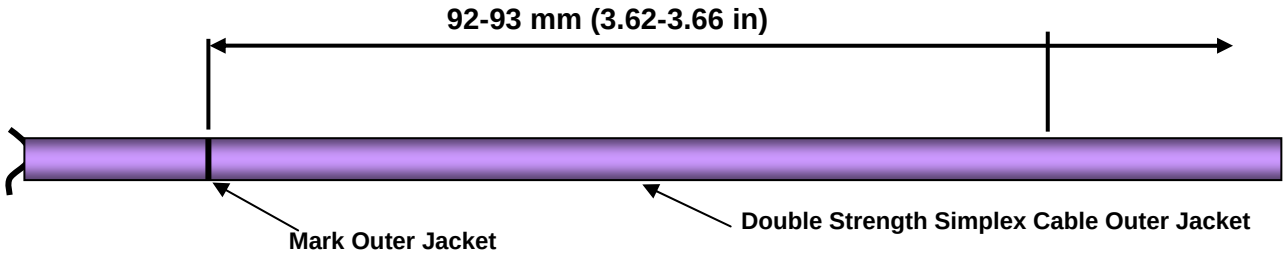


Figure 7-15 – Marking the Outer Jacket of the Double Strength Simplex Cable

CAUTION

Use caution when cutting the double strength simplex outer cable jacket. Do not cut into the two optical fibers underneath the outer cable jacket.

Step 2 - Carefully cut and remove the double strength simplex cable outer jacket back to the mark using hot tweezers. See Figure 7-16.

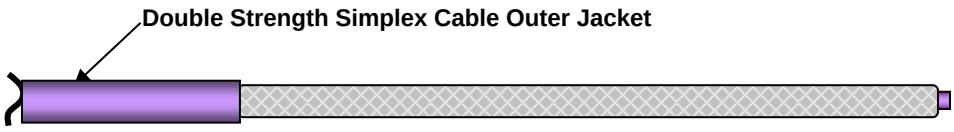


Figure 7-16 – Removing the Double Strength Simplex Outer Cable Jacket

Step 3 - Carefully unbraid the strength members back to the double strength simplex cable outer jacket and cut to 1.5mm (0.060 in)-2.5mm (0.098 in) as measured from the outer jacket. See Figure 7-17.

Figure 7-17 – Cutting the Strength Members to Length

CAUTION

Use caution when shrinking down the heat shrink. Excessive heat can cause damage to the outer jacket of the optical cable.

Step 4 - Slide the white heat shrink, part number M23053/5-104-9, 9.5mm +/- 2.5mm (0.375 +/- 0.10 in) long up onto the individual jacketed optical fiber 70-72mm (2.76-2.84 in) from the cut end of the cable. See Figure 7-18.

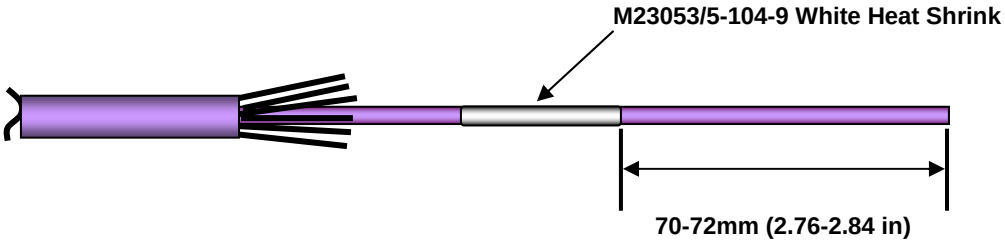


Figure 7-18 – Installing White Heat Shrink Sleeve

Step 5 - Slide the black heat shrink, part number DWP-125 1/4-0, 38mm +/- 2.5mm (1.50 in +/- 0.10 in) long up onto the outer dual fiber cable jacket. There should be approximately 0.60mm (0.025 in) of the white heat shrink exposed from under the black heat shrink. See Figure 7-19.

Figure 7-19 – Installing Black Heat Shrink Sleeve

Step 6 - Shrink down the black heat shrink sleeve using a heat gun no hotter than 210ºC. Ensure to maintain the correct amount of exposure of the white heat shrink. See Figure 7-20.

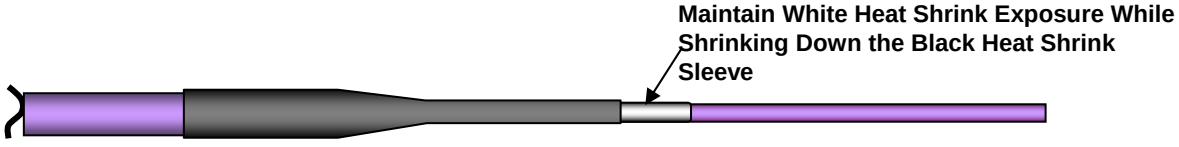


Figure 7-20 – Installing White Heat Shrink Sleeve

Step 7 - Proceed to section P3 to continue with the termination procedure.

P3. Simplex Cable Preparation Procedures

Step 1 - Install the crimp sleeve, that is supplied with the terminus, over the simplex cable (single fiber cable). Ensure that the crimp sleeve is installed onto the cable rib side first. Slide the crimp sleeve back from the end of the simplex cable. See Figure 7-21.

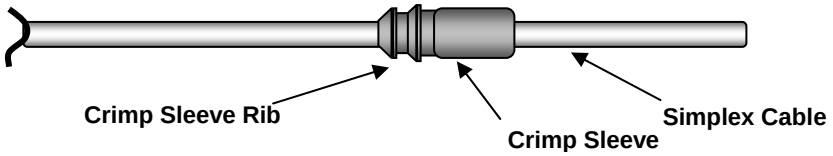


Figure 7-21 – Installing Wire Marker Sleeve and Crimp Sleeve

Note: Perform Step 2 for 801 LM and 801 LS termini for “Loose” Structure Cable.

Note: Perform Step 3 for 801 TM and 801 TS termini for “Tight” Structure Cable.

Step 2 - Mark the “Loose” Structure cable outer jacket 27 mm (1.06 in) - 30 mm (1.18 in). See Figure 7-22.

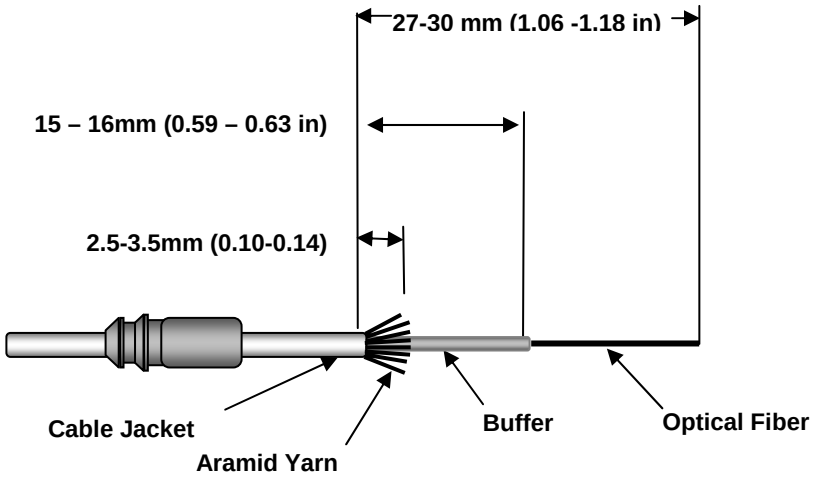


Figure 7-22 – “Loose” Structure Cable Stripping Dimensions for 801 LM and 801 LS Termini

Step 3 - Mark the “Tight” Structure cable outer jacket 25 mm (1.06 in) - 28 mm (1.18 in) . See Figure 7-23.

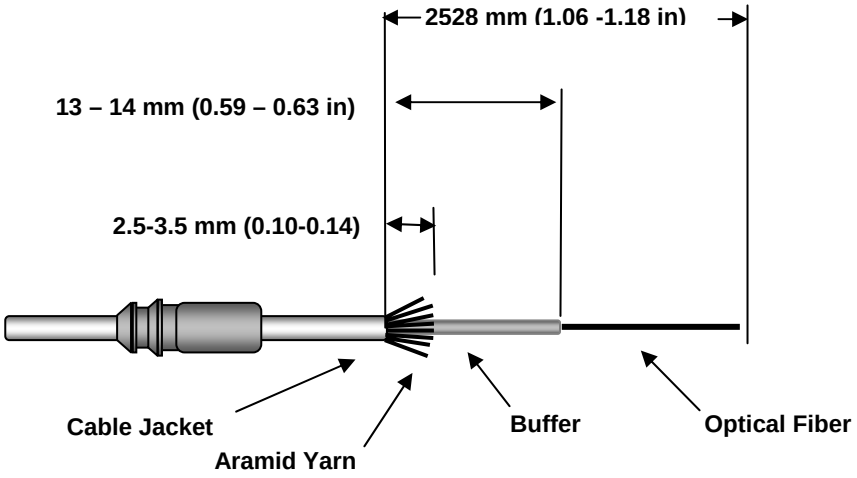


Figure 7-23 – "Tight" Structure Cable Stripping Dimensions for 801 TM and 801 TS Termini

Step 4 - Cut and remove the simplex cable outer jacket back to the mark using the simplex cable stripper.

Note: The optimum way to remove the simplex cable jackets is to ring cut the jacket with the simplex cable stripper and pull the jacket off by hand. Pushing off the simplex cable jacket with a tightly held simplex cable stripper can lead to fiber breakage.

Step 5 - Next remove the tape that is wrapped around the secondary buffer and cut the aramid yarn leaving 2.5 – 3.5mm (0.10 – 0.14 in) using the strength member shears.

WARNING

Wear safety glasses when removing the fiber buffer and coating to avoid possible eye injury.

Step 6 - Put on safety glasses and mark the buffer, for the correct type of termini and cable type being terminated. Refer to Figure 7-23 for "Loose" Structure cable and termini (801 LM / 801 LS) and refer to Figure 7-24 for "Tight" Structure cable and termini (801 TM / 801 TS). Remove the fiber buffer and coatings back to the mark ,on the buffer, using the buffer stripper. Remove the buffer and coating in small sections approximately 6 mm (0.25 in) at a time.

Note: Normally, the buffer and coating are tightly adhered to one another and come off of the fiber at the same time.

Note: Some aerospace cables have a silicone buffer, which can be remove in one section, using the buffer stripper, instead of having to be removed in 6 mm (0.25 in) increments.

CAUTION

The uncoated fiber is in its most vulnerable state. Limit the fiber's exposure to the atmosphere to no more than 30 minutes. Take extreme care not to damage the fiber. Breakage of any one fiber from this point until the connector is completely assembled will require repetition of this and the following steps in order to maintain approximately equal length of all the fibers in the cable.

Step 7 - Remove any residual coating material from the bare fibers with a wipe dampened with a quality optical cleaning solution. Wipe only once from the end of the buffer towards the end of the fiber.

Note: Do not repeatedly wipe the bare fiber, as this will weaken the fiber.

Note: Silicone coated fibers may require additional cleaning to ensure the all of the silicone has been removed. If the all of the silicone is not removed, then the epoxy may not properly adhere and cause terminus failure.

Note: Tolerance on the overall length of the cable harness should be +13/-7 mm (+0.5/-0.25 in) for cables under 1 meter (3 ft), +25/13 mm (+1.00/-0.50 in) for cables 1-3 meters (3-10 ft) and ±25 mm (.±1.00 in) for cables over 3 meters (10 ft). One approach to fabricate a cable with this tolerance is given by providing an example of a cable with a face-of-terminus to face-of-terminus required length of 2.540 m (100 inches). Start with a cut cable length of 2.69 to 2.84 m (106 to 112 inches). This length will allow two to three terminations of the first end in the event the terminus must be cut off and replaced. No leeway can be given for re-termination of the second end. After successful termination of the first end, measure to 2.559 m (100.75 inches) from the face of the terminus to the cut point. Do second end termination. After a 1.5 mm (0.63 inch) length of fiber cleaved from the end, the face-of-terminus to face-of-terminus length should be about 2.543 m (100.13 inch). The cable length falls midrange between the allowed cable length of 2.540 to 2.546 m (100 to 100.25 inches).

c. Installation of the 801 LM, 801 LS, 801 TM, and 801 TS termini onto the fiber.

Note: This procedure describes the process for installing 801 LM, 801 LS, 801 TM, and 801 TS termini onto either multimode or single-mode fibers. Epoxy is used to secure the fiber in the terminus for mating purposes.

Note: Step 1 below needs to be accomplished prior to installing the terminus onto the simplex cable.

Step 1 - Plug in the curing oven. Turn the oven on (Haute Position) and turn the thermostat knob to position 3. Place a thermometer in one of the oven ports. Verify that the orange indicator light is illuminated. See Figure 7-24.

Note: The oven shown in Figure 7-25 is from the manufacturer of the 801 Terminus. This oven is set to cure the EPO-TEK 353ND epoxy at 90ºC -2º /+5ºC. The terminus is cured in the oven for twenty (20) minutes. Other epoxy cure ovens may be used as long as they meet the temperature requirements of 90ºC -2º /+5ºC. Some harsh environments on the aircraft (landing gear, engine compartments or unpressurized areas) may require the use of a programmable oven which cures the epoxy at different temperature levels with varying ramp and soak times. Refer to the manufacturers procedures when using a programmable oven.

Note: The manufacturer of the 801 terminus utilizes EPO-TEK 353ND epoxy for aerospace applications. There are other aerospace epoxies that may be utilized. Refer to the manufacturers procedures for the cure temperature and curing time.

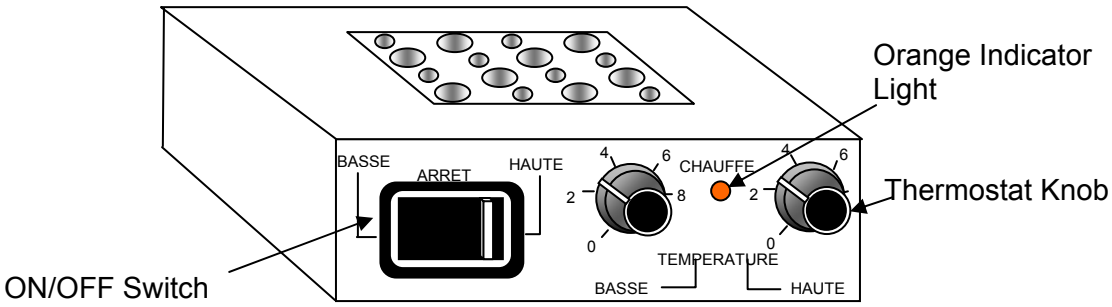


Figure 7-24 – Epoxy Curing Oven

Step 2 - Remove the divider from a 2-part EPO -TEK 353ND epoxy package and slowly mix the two parts together until the epoxy is a smooth uniform color. The epoxy can be mixed by either repeatedly rolling the divider over the package or gently sliding the divider over the package. See Figure 7-25.

CAUTION

Do not introduce large air bubbles into the epoxy during the mixing process. Mix the epoxy slowly to minimize the introduction of air bubbles. Large air bubbles in the epoxy can lead to connector failure during temperature extremes.

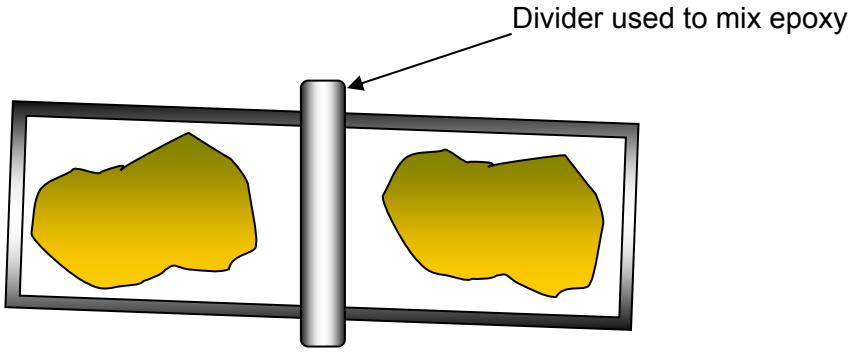


Figure 7-25 – Mixing the EPO_TEK 353ND Epoxy

Note: Alternatively, the epoxy may be mixed by slowly massaging the epoxy package over the edge of the workbench or table.

Step 3 - Once the epoxy is mixed, pour into a crucible or any other shallow container.

WARNING

Wear safety glasses while dispensing the epoxy to avoid possible eye injury.

Step 4 - Make sure the volumeter counter on the resin injector is set to 0.26 (2.6µl). If it is not correctly positioned, then turn the knob until it indicates 0.26 (026) in the volumeter counter window. See Figure 7-26.

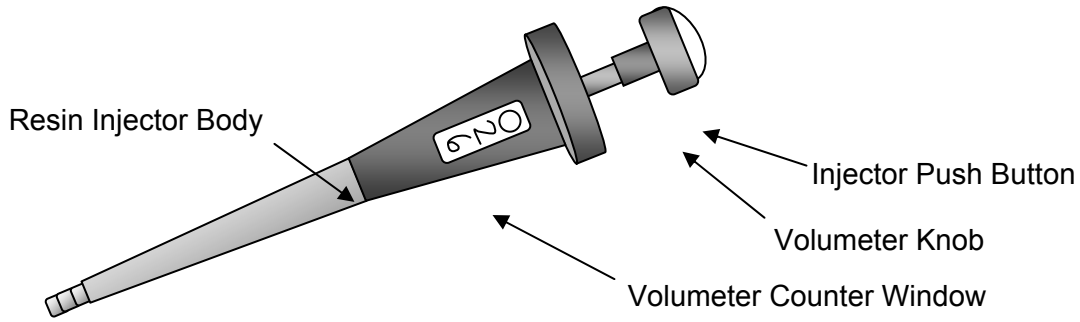


Figure 7-26 – Resin Injector and Volumeter Counter Knob

Step 5 - Completely depress the injector push button and insert the new piston into the metal fitting of the injector mandrel until it locks into place. Release the injector push button. See Figure 7-27.

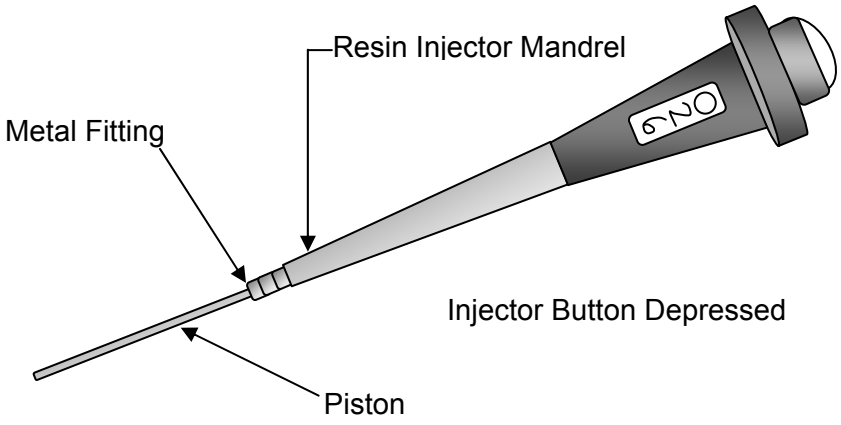


Figure 7-27 – Installing the Piston into the Resin Injector Mandrel

Step 6 - Push the new capillary over the piston until it locks into position on the resin injector mandrel. See Figure 7-28.

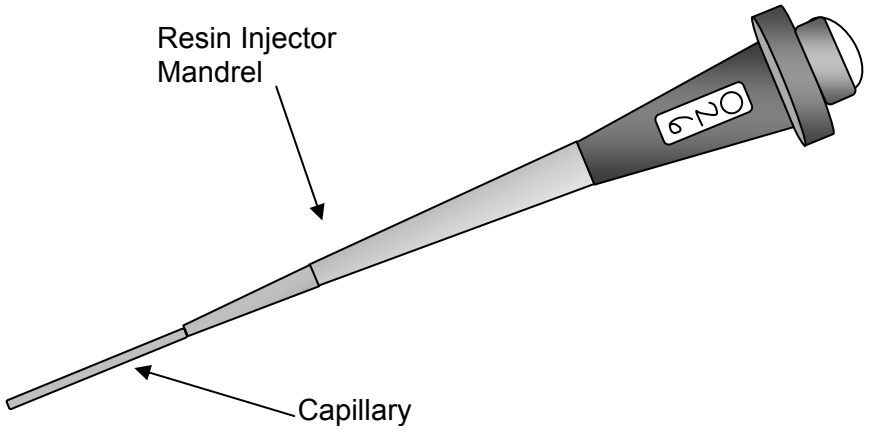


Figure 7-28 – Installing the Capillary onto the Resin Injector Mandrel

Step 7 - Depress the injector push button and introduce the end of the capillary into the container holding the EPO_TEK 353ND epoxy. Gently release the injector push button to pick up the epoxy until the piston is fully extended. See Figure 7-29.

Note: Avoid picking up any air bubbles. If air bubbles have been picked up, leave the capillary in the epoxy and push out half the amount of epoxy lifted. Then repeat step 8.

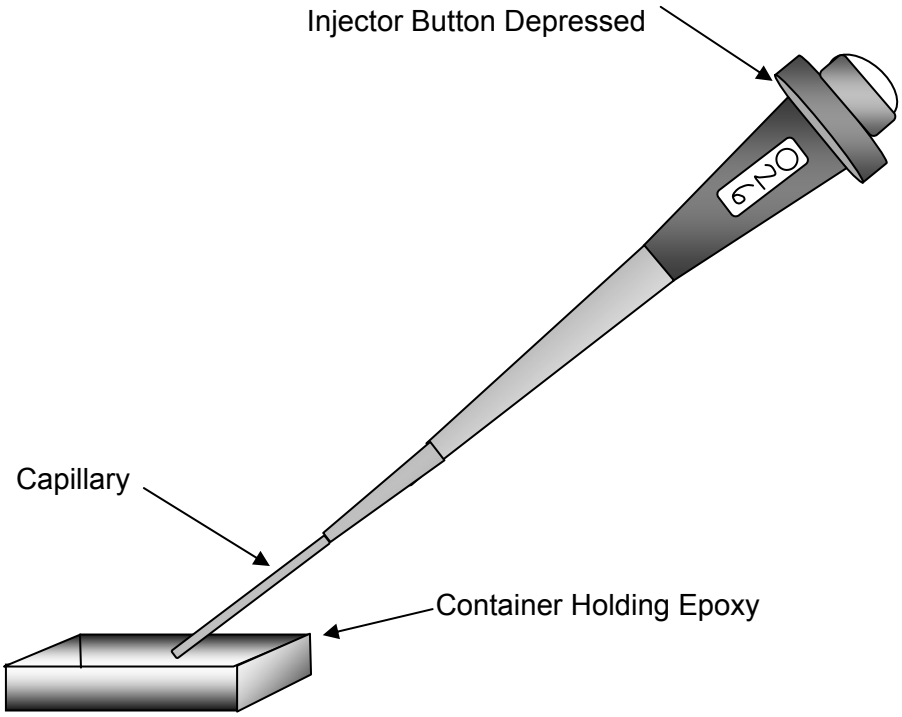


Figure 7-29 – Picking up the Epoxy into Resin Injector

Step 8 - Wipe the capillary and tip clean using a dry lint free wipe.

Step 9 - Inspect the terminus and verify that the ferrule hole is free and clean of dirt. This can be accomplished by holding the front of the terminus up to a light and verifying that the light is visible from the rear of the terminus. If light cannot be seen through the terminus, push music wire through the terminus hole to clear it. Then blow dry air through the hole to remove any debris. (See note below for tight ferrule hole tolerance applications).

Note: For some applications, there may be a tight ferrule hole tolerance requirement. If the application requires a tight ferrule hole tolerance, then several terminus with different ferrule hole diameters will need to be kept on hand. Dry fit the terminus onto the fiber, to ensure proper ferrule hole clearance, before injecting epoxy into the terminus. Try the smaller ferrule hole diameter first; if the terminus will not fit then proceed to the next larger ferrule hole diameter.

Step 10 - Position the end of the capillary over the end of the ceramic ferrule of the 801 terminus. See Figure 7-30.

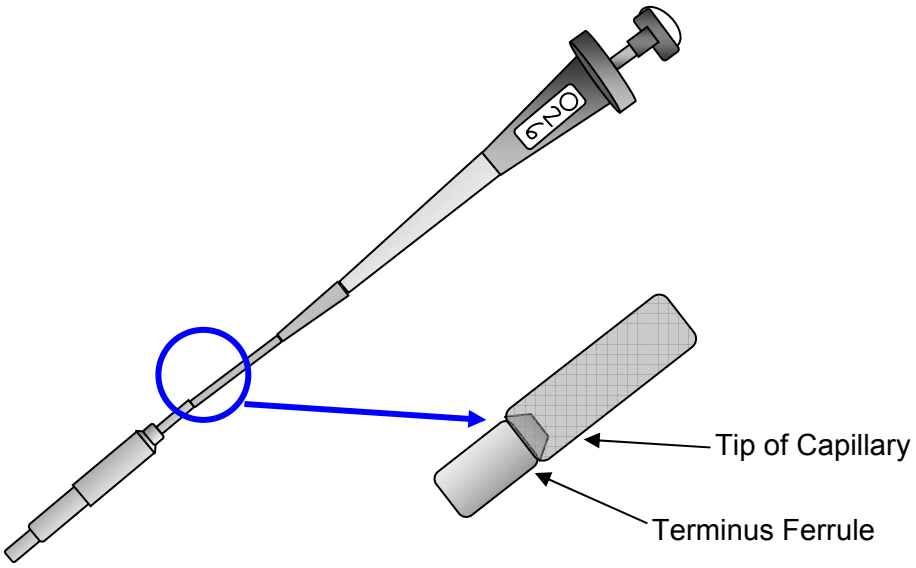


Figure 7-30 – Injecting the Epoxy into the 801 Terminus Ferrule.

Step 11 - Press the injector push button gently so that the epoxy is injected into the ferrule hole. Inject all of the epoxy from the resin injector into the terminus.

Note: Ensure the capillary is firmly seated against the ceramic terminus end face prior to injecting the epoxy.

Step 12 - Keeping the injector push button depressed, lift the capillary away from the terminus end face. Release the push button.

Note: Using a dry lint free cloth, wipe away any excess epoxy from the side of the ceramic ferrule and from the ferrule end face if the epoxy bead is excessive.

Step 13 - Screw the 0.9 mm adapter into the aramid yarn shaping tool. See Figure 7-31.

Figure 7-31 – Installing the 0.9 mm Adapter onto the Shaping Tool

CAUTION

Be careful not to break the optical glass when inserting into the adapter of the shaping tool.

Step 14 - Insert the adapter tool over the optical glass and push up until the adapter goes up under the outer jacket and stretches the outer jacket. See Figure 7-32.

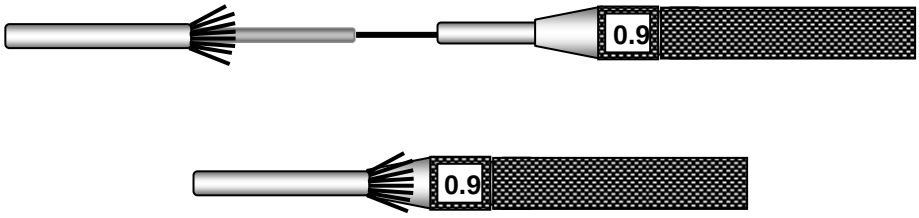


Figure 7-32 – Installing the Shaping Tool under the Outer Jacket

Step 15 - Remove the shaping tool from the fiber cable.

Step 16 - Install the terminus onto the fiber by gently working the fiber trough the terminus until the buffer seats against the rear of the terminus. See Figure 7-33.

Note: The outer cable jacket should come up and over the rear of the terminus and the aramid yarn should evenly surround the rear of the terminus.

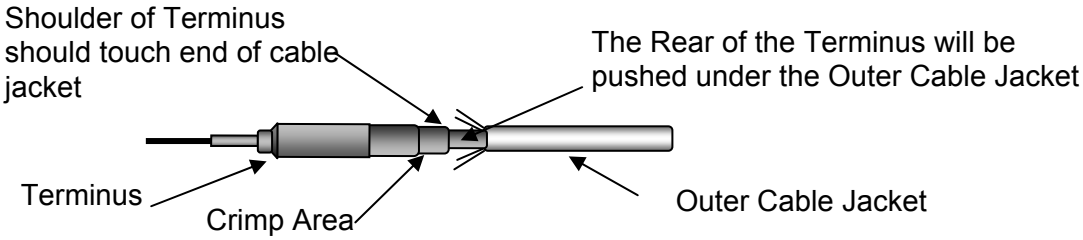


Figure 7-33 – Installing the Terminus onto the Fiber

Step 17 - Add a drop of epoxy to the crimp area, located at the rear of the terminus. See Figure 7-34.

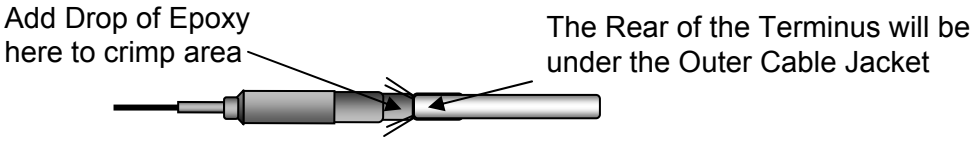


Figure 7-34 – Adding a Drop of Epoxy to Rear of Terminus

Step 18 - Slide the crimp sleeve up to capture the aramid yarn around the rear of the terminus. See Figure 7-35.

Note: Verify that the aramid yarn does not protrude excessively from under the crimp sleeve. Aramid yarn protrusion will cause the terminus to not seat properly in the finished connector. If excessive aramid yarn protrudes from under the crimp sleeve, trim it back using strength member shears.

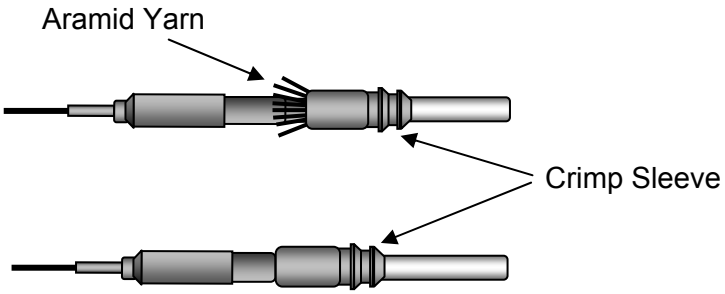


Figure 7-35 – Sliding up the Crimp Sleeve

Step 19 - Verify that there is a small amount of epoxy around the fiber where it protrudes from the ferrule. If it is found that there is no small bead of epoxy on the terminus tip, carefully add a small amount of epoxy around the fiber. See Figure 7-36.

Note: There should only be a small amount of epoxy around the fiber to support it later during the polishing process. If too much epoxy is around the fiber during the curing process, it may cause damage to the optical glass fiber.

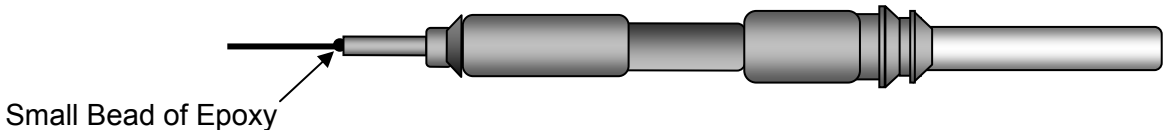


Figure 7-36 – Bead of Epoxy

Step 20 - Using a wipe dampened with alcohol or quality optical cleaning solution, carefully wipe away any excess epoxy on the fiber that is more than 2 mm (0.1 in) from the ferrule tip surface.

Step 21 - Crimp the crimp sleeve using the 2.54 mm hex cavity. See Figure 7-37.

Note: Make sure to align the 2.54 mm crimp die cavity properly over the crimp sleeve. Do not crimp onto the terminus body. When properly crimped there will not be any flaring of the crimp sleeve. See Figure 7-38.

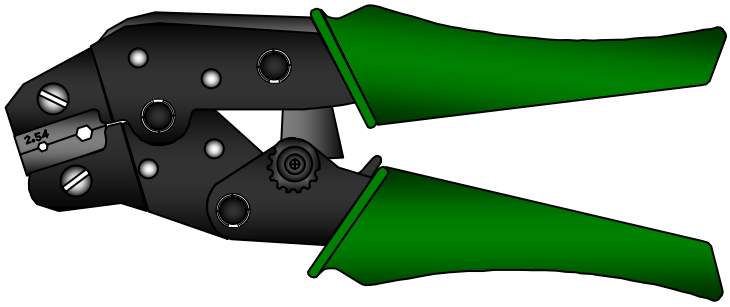


Figure 7-37 – 801 LM Crimp Tool use 2.54 mm Cavity

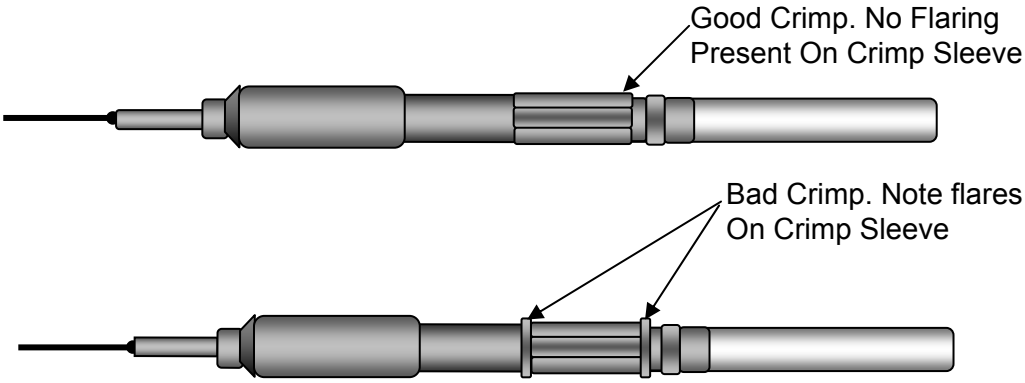


Figure 7-38 – Example of Good Crimp and Bad Crimp

Step 22 - Repeat steps 7 through 21 for each fiber to be terminated.

Step 23 - Read the thermometer and verify that the oven temperature is at 90°C -2°/+5°C.

CAUTION

Do not touch the end of the exposed optical fiber on the sides of the oven ports when installing the terminus into the oven.

Step 24 - Carefully place the terminus in the curing oven, and position the cable vertically over the oven. Loosen the cable support knob and rotate the cable support clamp into position and re-tighten the knob. Slide the outer

jacket of the cable into the foam retention pad. See Figure 7-39.

Note: When the cable is positioned above the terminus, make sure that no bends are placed in the simplex cables.

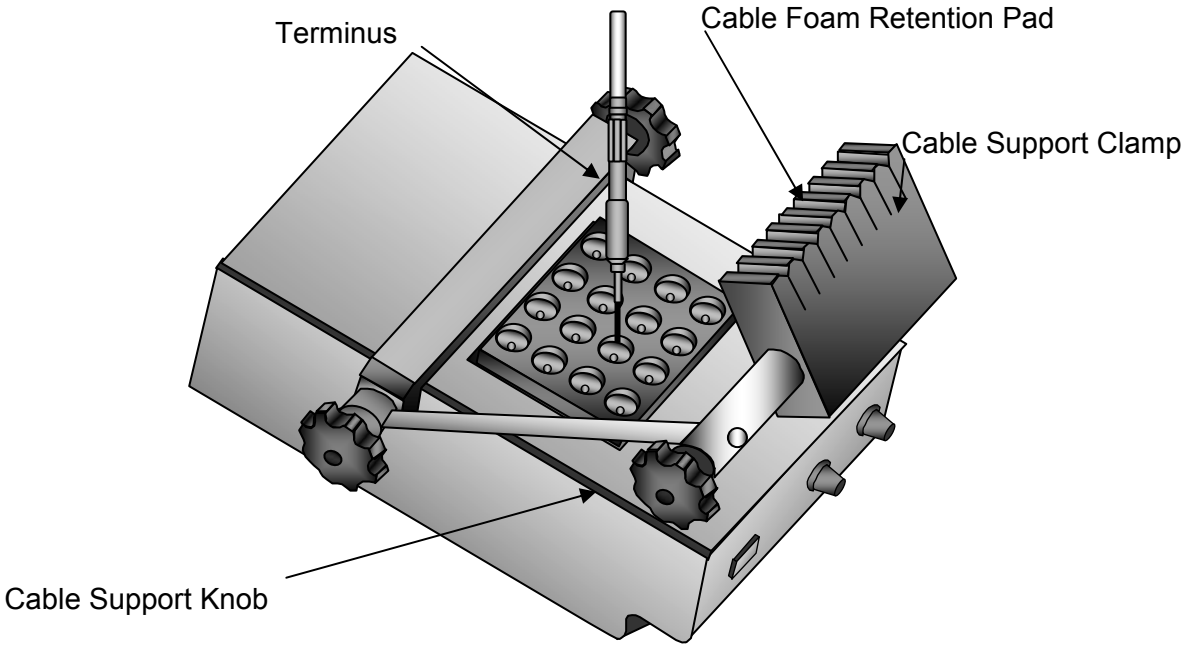


Figure 7-39 – Curing Oven and Cable Support Clamp

WARNING

Do not touch the terminus when removing from the oven as severe burns will be the result**.**

Step 25 - After twenty (20) minutes, remove the terminus from the curing oven. The terminus should remain in the oven for a minimum of 20 minutes.

Note: The EPO_TEK 353ND epoxy will take on a brown color when cure is complete. This can be verified by looking at the epoxy bead on the ceramic ferrule of the terminus. Other epoxies may produce different colors.

d. Polishing the fiber ends.

Note: Use one of the two following procedures, whichever is applicable.

(1) Procedure 1: Standard polish for domed ferrules.

Note: This procedure will produce a PC polish on a terminus with a domed end face on the ferrule. This procedure is typically used for single mode applications with a minimum return loss requirement of 30 db.

Note: Procedures for hand polishing are contained herein. Machine polishing may be used as an alternate method, provided the following requirements are satisfied:

(a) The manufacturer's instructions will be rigidly adhered to, except that the polishing papers or disks should be 3 µm aluminum oxide Mylar backed, 1 µm aluminum oxide Mylar backed, and 0.3 µm aluminum oxide Mylar backed as used in hand polishing.

Note: Alternate polishing materials may be used if authorized approval is obtained and the polishing machine includes the appropriate stops to prevent changes to the ferrule length.

(b) The machine polished terminus should undergo the same quality check used for the manually polished terminus as described herein.

Note: The procedures contained herein should produce an optical terminus with a physical contact (PC) polish.

WARNING

Safety glasses should be worn prior to scribing the optical fiber.

Step 1 - After the terminus has cooled down, carefully score the fiber close to the terminus tip at the epoxy interface using one short light stroke with cleaving tool. Pull off each fiber with a gentle, straight pull. Deposit the waste fiber in a trash container. See Figure 7-40.

Note: Do not break the fibers with the cleaving tool. The goal is to lightly scratch the optical glass without causing the glass to break.

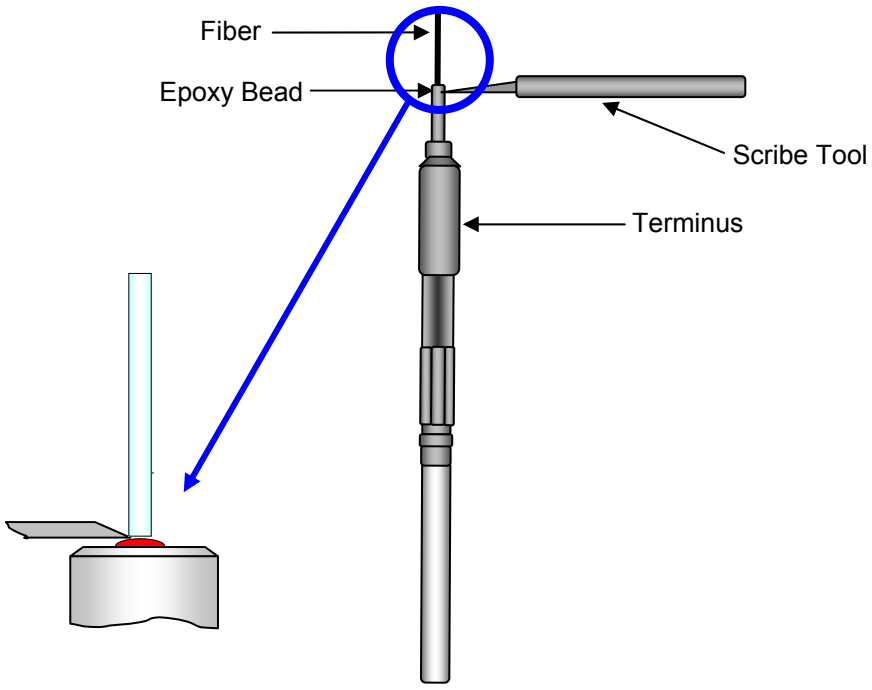


Figure 7-40 – Scoring the Fiber

Note: Before inserting the terminus into the polishing tool, the terminus may be held vertically and the end of the fiber polished off by lightly running the 5 µm polishing paper over the top of the terminus tip. (This is referred to as air polishing the terminus.)

Step 2 - Clean the glass polishing plate, the resilient pad, the backs of the polishing papers, and the surface of the polishing tool using a wipe dampened with alcohol or quality optical cleaning solution. Blow all of the surfaces dry with canned air.

Step 3 - Insert the terminus into the polishing tool
See Figure 7-41.

Note: Difficulty in inserting the connector ferrule into the polishing tool may indicate epoxy on outside of the ferrule that must be removed before proceeding.

Note: Clean the terminus and polishing tool prior to terminus insertion.

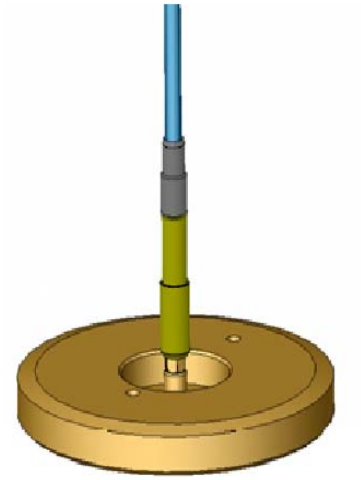


Figure 7-41 – Inserting the Terminus into the Polishing Tool

Step 4 - Place the 3 µm aluminum oxide polishing paper on the flexible thick side of the resilient (rubber) pad and start polishing the terminus with very light pressure (the weight of the tool) using a figure-8 motion. Do not over polish the terminus.

Note: The first polish is complete when almost all of the epoxy is gone from the tip of the terminus. Since the polishing time varies with the amount of epoxy present on the tip of the terminus, inspect the terminus tip frequently. Whenever the polishing tool is lifted, remove the grit from the tool and the terminus with a wipe dampened with alcohol or quality optical cleaning solution or with canned air. When polishing is complete, clean the terminus and the polishing tool using a wipe dampened with alcohol or quality optical cleaning solution and blow them dry with canned air. Perform a rough inspection of the ferrule end using the eye loop.

Step 5 - Place 1 µm aluminum oxide polishing paper on the hard thin side of the resilient pad. Polish the terminus with light pressure using a figure-8 motion until all of the epoxy is removed from the tip of the terminus. Inspect the terminus end face with the 200x scope for multimode connectors and use the 400x inspection scope for single-mode connectors to verify that all of the epoxy has been removed. When polishing is complete, clean the terminus, and the polishing tool using a wipe dampened with alcohol or quality optical cleaning solution and blow them dry with canned air.

Note: The 1 µm aluminum oxide polish is complete when all of the epoxy is gone from the tip of the terminus.

Step 6 - Replace the 1 µm aluminum oxide paper with the 0.3 µm aluminum oxide paper. Polish the terminus with light pressure using a figure-8 motion for 3 complete motions. When polishing is complete, clean the terminus and the polishing tool using a wipe dampened with alcohol or quality optical cleaning solution and blow them dry with canned air.

Note: Additional figure 8's may be required, on the 0.3 µm aluminum oxide polishing paper, to remove any scratches found during the visual inspection with the fiber optic microscope.

Step 7 - Repeat steps 1 through 6 for all of the termini.

Procedure 2: Enhanced polish for domed ferrules.

Note: This procedure will produce a PC polish on a terminus with a domed end face on the ferrule. This procedure is typically used for single mode applications with a minimum return loss requirement of 40 dB.

Note: Procedures for hand polishing are contained herein. Machine polishing may be used as an alternate method, provided the following requirements are satisfied:

(a) The manufacturer's instructions will be rigidly adhered to, except that the polishing papers or disks should be 3 µm aluminum oxide Mylar backed, 1 µm aluminum oxide Mylar backed, and 0.3 µm aluminum oxide Mylar backed as used in hand polishing. (Note: Alternate polishing materials may be used if authorized approval is obtained and the polishing machine includes the appropriate stops to prevent changes to the ferrule length.)

Note: Alternate polishing materials may be used if authorized approval is obtained and the polishing machine includes the appropriate stops to prevent changes to the ferrule length.

(b) The machine polished terminus should undergo the same quality check used for the manually polished terminus as described herein.

Note: The procedures contained herein should produce an optical terminus with a physical contact (PC) polish.

Step 1 - Perform steps 1 through 6 of the standard polish procedure.

Step 2 - Replace the 0.3 µm aluminum oxide paper with the ultra fine paper. Wet the paper and polish the terminus with no pressure using a figure-8 motion for 10 to 30 complete motions.

Note: Clean per step 3 of standard polish procedure prior to placing the terminus on the polishing paper.

Note: The glossy side of the ultra fine paper should be placed facing the resilient pad.

Note: The polish tool should hydroplane above the paper surface during this polish.

Step 3 - Clean the terminus and the polishing tool with a wipe dampened with alcohol or quality optical cleaning solution then dry.

Step 4 - Repeat steps 1 through 3 for all of the termini.

e. Quality check.

Step 1 - Examine the terminus with the optical microscope to ensure that the optical surface is smooth and free of scratches, pits, chips, and fractures If any defects are present, repeat the polish with the 0.1 um paper or re-terminate the fiber. See Figure 7-42.

Note: Do not polish the terminus more than necessary to pass the quality check.) A high intensity back light may be used to illuminate the fiber during the quality check.

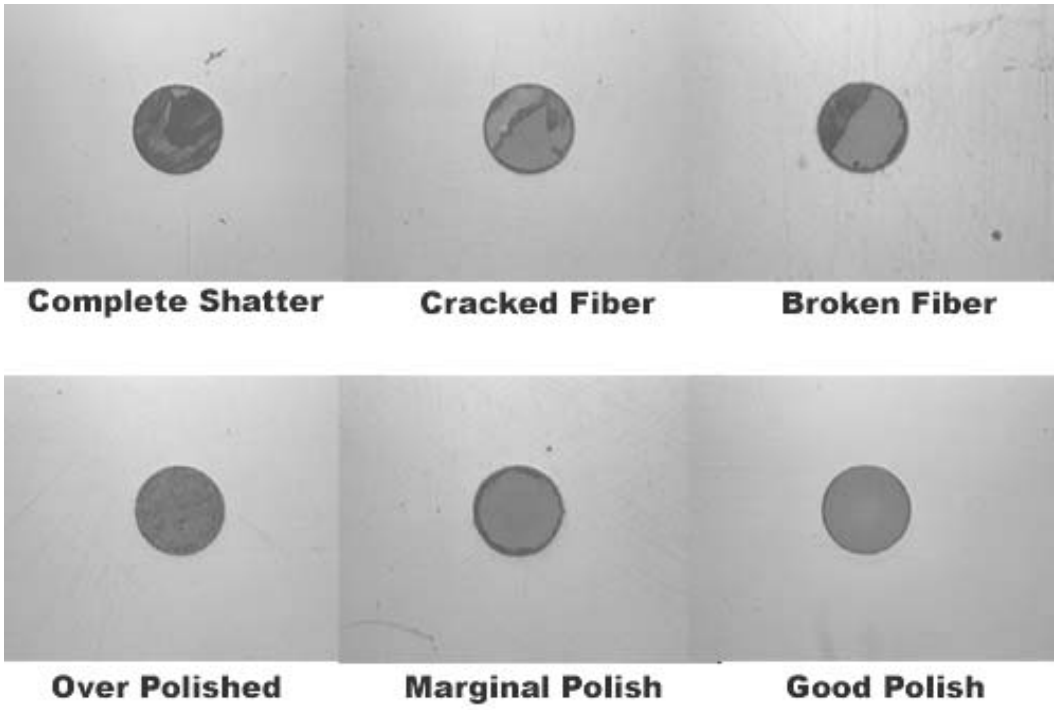


Figure 7-42 – Visual Connector End Face Inspection at 200x

Note: When printing the above photos from the electronic version of this document, a high-resolution printer should be used.

f. Installation of the terminus into a circular connector.

Note: Any connector fitting or adapter must be installed onto the cable, prior to the installation of the terminus into the connector.

Note: Ensure tube on insertion tool is not damaged. A damaged tube could cut the grommet inside the connector.

Note: The plastic insertion/removal tool (M81969/14-03) is blue on one side and white on the other side. The blue side is for insertion and the white side is used for removal.

Step 1 - Remove the alignment sleeve spacer before inserting the terminus into the circular plug connector, if equipped.

Step 2 - Place the terminus into the insertion tool (blue side) around the cable and slide up to the shoulder of the terminus See Figure 7-43.

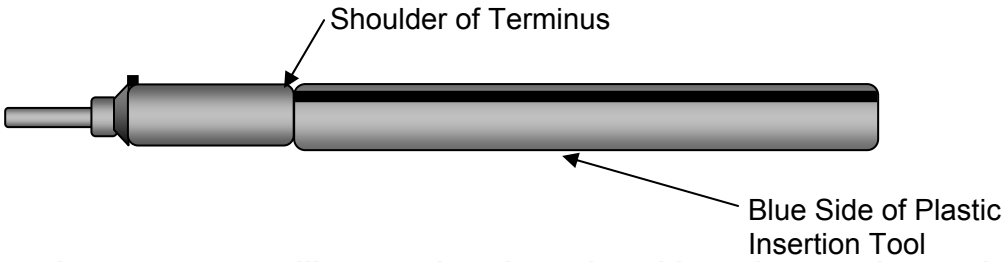


Figure 7-43 – Installing Terminus into Blue Side of the Insertion Tool

CAUTION

Do not use a lubricant to aid in inserting the terminus into the connector.

Step 3 - Place the terminus in the proper cavity in the rear of the connector insert ensuring that the key is aligned with the alignment mark on the grommet. Apply pressure with the insertion tool until the terminus snaps into place See Figure 7-44.

Note: A properly inserted terminus will have some axial “play” within the insert cavity.

Note: Termini are also designed for insertion into the rectangular EPX Series connectors, ARINC 404 and 600 series connectors. See manufacturer procedures for installing terminus into EPX Series connectors, ARINC 404 and 600 series rectangular connectors.

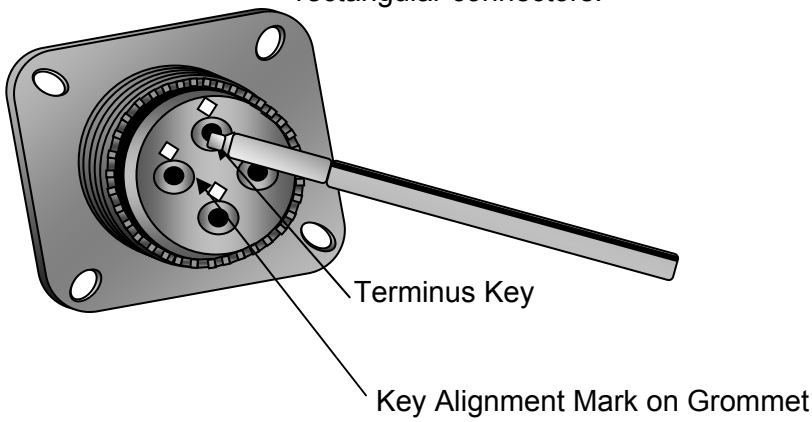


Figure 7-44 – Installing Terminus into the Circular Connector

Step 4 - Repeat steps 2 and 3 for all of the termini.

Step 5 - Visually verify that all of the termini are fully seated prior to installing the alignment sleeve spacer (if equipped). Install the alignment sleeve spacer prior to mating the circular plug to the circular receptacle.

g. Insertion of a hex keyed 801 legacy terminus.

Note: Some 801 legacy termini have hexagonal keys that must be properly aligned with the printed hex key pattern on the rubber grommet prior to inserting the terminus. The hexagonal key is not the standard terminus, but is installed on some aircraft systems.

Note: Any connector fitting or adapter must be installed onto the cable, prior to the installation of the terminus into the connector.

Note: Ensure tube on insertion tool is not damaged. A damaged tube could cut the grommet inside the connector.

Note: The plastic insertion/removal tool (M81969/14-03) is blue on one side and white on the other side. The blue side is for insertion and the white side is used for removal.

Step 1 - Place the terminus into the insertion tool (blue side) around the cable and slide up to the shoulder of the terminus See Figure 7-45.

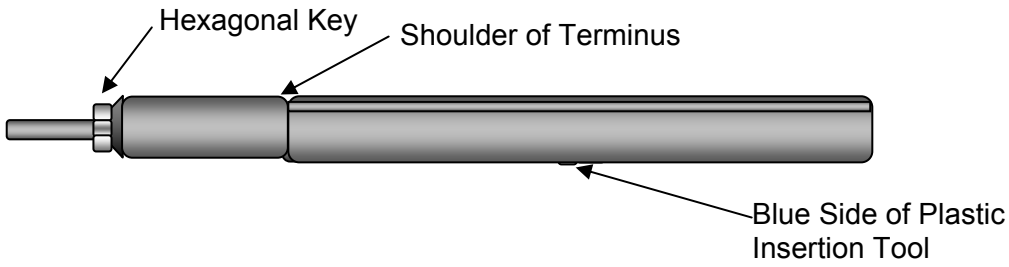


Figure 7-45 – Installing Terminus into Blue Side of the Insertion Tool

CAUTION

The hexagonal key on the legacy 801 terminus must be properly aligned with the printed hexagonal pattern on the rubber grommet prior to insertion of the terminus.

Step 2 - Place the terminus in the proper cavity in the rear of the connector insert while aligning the hexagonal key on the terminus with the printed hexagonal pattern on the rubber grommet. Apply pressure with the insertion tool until the terminus snaps into place See Figure 7-46.

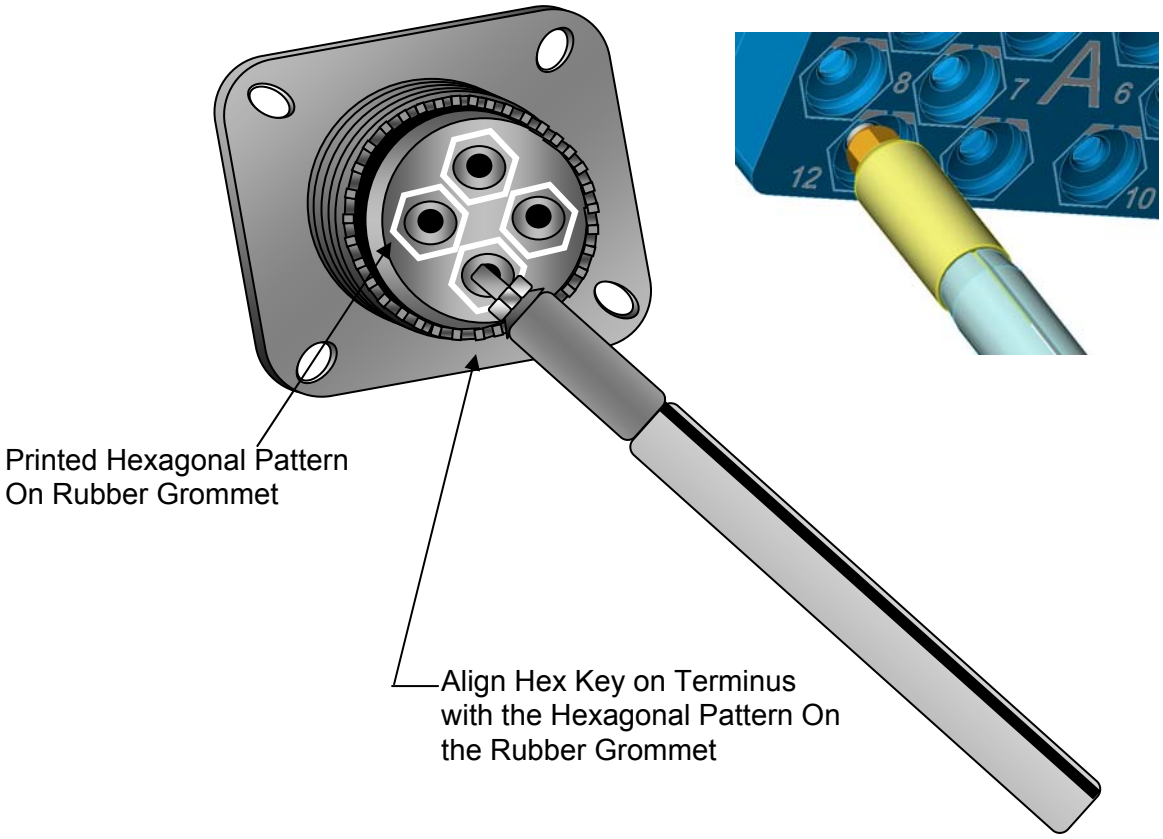


Figure 7-46 – Inserting Terminus While Aligning the Terminus Hex Key with the Printed Hexagonal Pattern on the Rubber Grommet

Step 3 - Visually verify that all of the termini are fully seated prior to installing the alignment sleeve spacer (if equipped). Install the alignment sleeve spacer prior to mating the circular plug to the circular receptacle.

Step 4 - Repeat steps 1 through 2 for all of the termini.

h. Circular connectors that penetrate pressure bulkheads.

Note: Some circular connectors that penetrate pressure bulkheads may require the connector to be potted to provide an air seal at the pressure bulkhead. See manufacturer's procedures.

i. Insertion of the 801 terminus into an ARINC 600 Connector.

Note: Follow manufacturer's procedures for installing the inserts into the ARINC connector.

Note: Any connector fitting or adapter must be installed onto the cable, prior to the installation of the terminus into the connector.