



Applications Engineering Notes

Document Title	MTP® Brand Connector Installation Onto Standard Oval Cabled Multimode and Single-mode Multifiber Optical Ribbon
Document Number	AEN-1401
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THE USE OF SAFETY GLASSES FOR EYE PROTECTION IS RECOMMENDED

1.0 Document Purpose

This document describes the termination and housing assembly procedure for US Conec MTP® brand multifiber optic connectors onto standard oval cabled multimode and single-mode multifiber optical ribbon.

2.0 Required Equipment and Materials

- Standard MTP® brand strip template
- Permanent marker
- US Conec optical cable jacket removal tool (P/N 6372)
- Scissors
- Ribbon holder modified for standard oval jacketed cable (P/N MTA-013M)
- Thermal ribbon matrix stripper
- US Conec fiber cleaver (P/N MFA-004) or other fiber cleaving device
- EXACTO® knife or other sharp cutting tool
- Isopropyl alcohol and lint free wipes
- Centrifuge or other outgassing device
- Epoxy Technologies 353 N/D epoxy bi-pak
- 3 cc syringe with a barrel tipped cap installed
- #25PPS .014 x .50 plastic needle tip
- Vacuum pump with MT nozzle (MT nozzle P/N 400025-01)
- US Conec 24 port curing oven (P/N 5545)

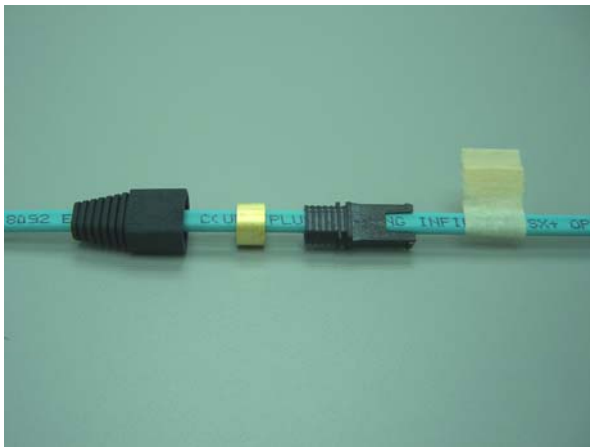
- US Conec scribing tool (P/N 2104076-01)
- Standard oval MTP® brand crimp tool and die set (P/N 12245)
- OPTIPOP R optical connector cleaner (Male P/N 6226, Female P/N 6227)

3.0 Cable Preparation

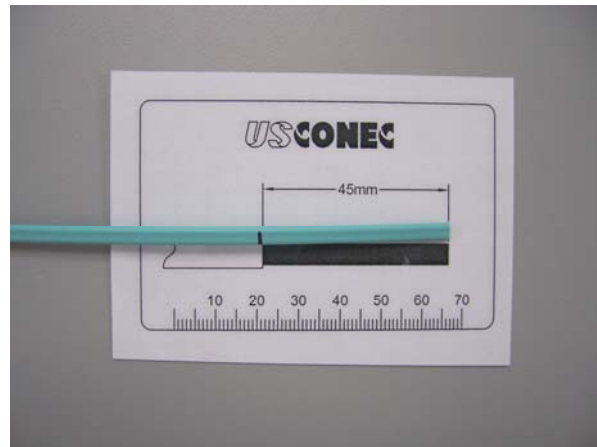
3.1 Slide the standard oval MTP® brand hardware onto the cable in the following order:

- 1) Standard oval MTP® brand boot (P/N MTP-012-06)
- 2) Standard oval MTP® brand crimp band (P/N MTP-A12-05)
- 3) Standard oval MTP® brand crimp body/spring push (P/N 6106)

Place a piece of tape around the cable to prevent the parts from falling off.



3.1



3.2

3.2 Place a mark on the cable jacket at 45 millimeters from the end.

- 3.3 Using the US Conec optical cable jacket removal tool, remove the jacket at the mark, exposing the aramid yarn. For further instructions, see US Conec Document # AEN-1406, “Instructions for Using the US Conec Cable Jacket Removal Tool”.



3.3a



3.3b

- 3.4 Using the scissors, remove the aramid yarn 2mm (± 1 mm) from the cable jacket.



3.4a

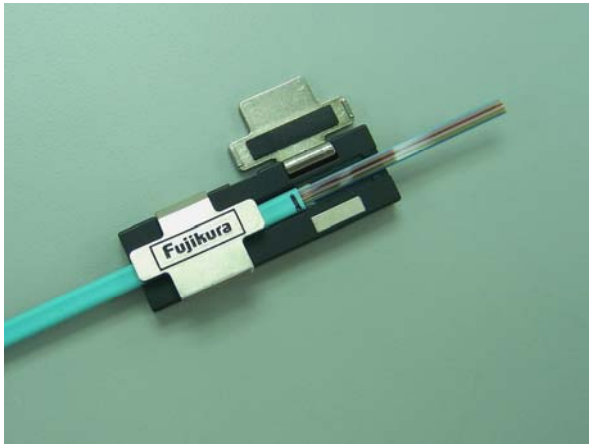


3.4b

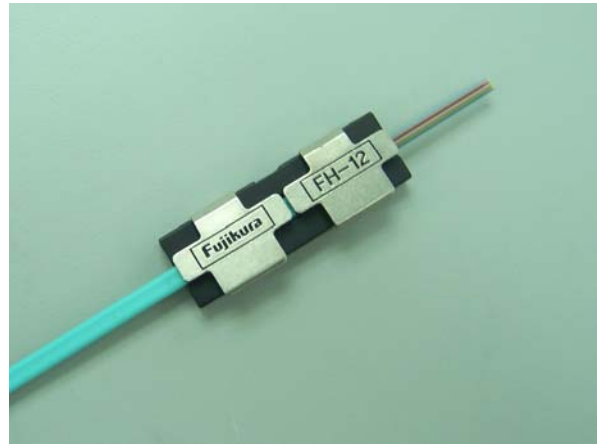
4.0 MT Ferrule Termination

4.1 Fiber Ribbon Preparation

- 4.1.1 Position the cable into the ribbon holder modified for standard oval jacketed cable (P/N MTA-013M). Make sure the end of the jacket is against the stop in the holder. Close the cover on the jacket end of the holder to secure the cable in place.



4.1.1



4.1.2

- 4.1.2 Align the ribbon in the ribbon tray. Close the cover on the ribbon end of the holder.

NOTE: The cover over the cable jacket does not close completely.

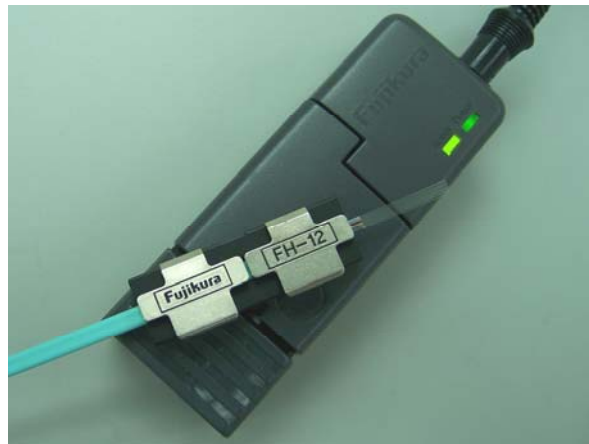
- 4.1.3 Using a thermal ribbon matrix stripper, remove the ribbon matrix and the fiber coating.



4.1.3a



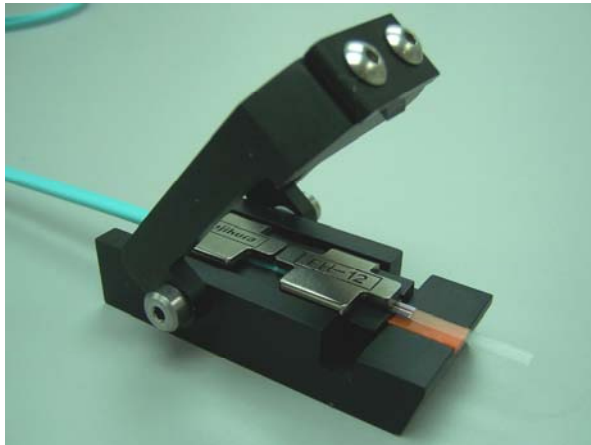
4.1.3b



4.1.3c

- 4.1.4 Place the ribbon holder into a fiber cleaving device and cut the fibers evenly at a length of 10 (\pm 2) millimeters. Check for damaged or broken fibers.

NOTE: Smooth, evenly cut fibers will aid insertion into the ferrule.

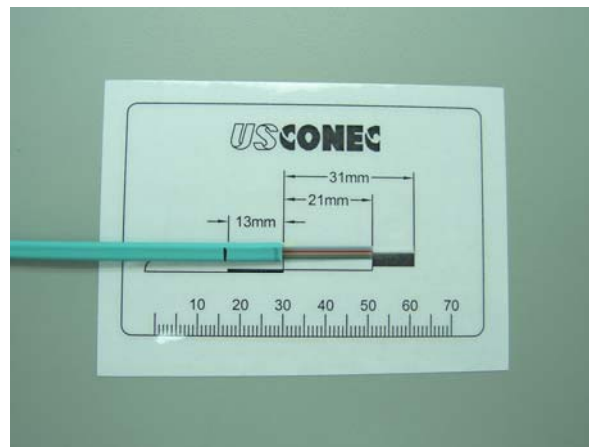


4.1.4a



4.1.4b

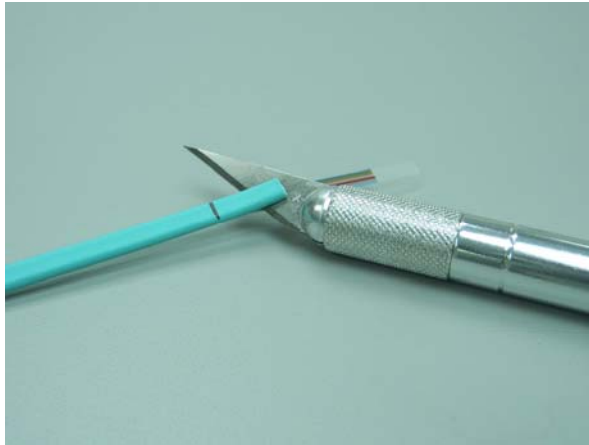
- 4.1.5 Remove the cable from the ribbon holder. The length of the unstripped ribbon extending from the jacket should be 21 (+0/-1) millimeters.
- 4.1.6 Using the strip template, mark the jacket 13 millimeters from the end.



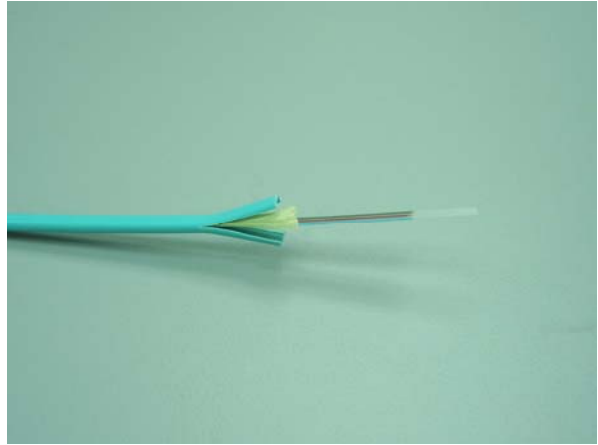
4.1.6

- 4.1.7 Using an EXACTO® knife or other sharp cutting tool, split the cable jacket to the 13 millimeter mark.

CAUTION: TAKE CARE TO NOT CUT YOURSELF OR NICK THE FIBER RIBBON DURING THIS STEP!

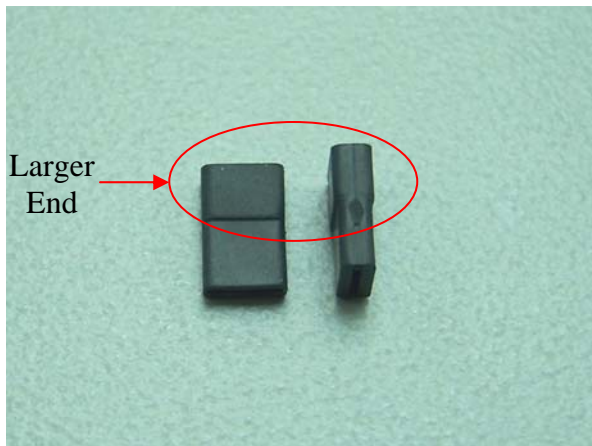


4.1.7a



4.1.7b

- 4.1.8 Slide an MTP® brand oval spring (P/N MTP-A12-03) and rubber ferrule boot onto the ribbon. Position the boot so that the larger end will insert into the rear of the ferrule. Take care not to break the bare fibers.



4.1.8a



4.1.8b

- 4.1.9 Carefully clean the bare fibers with lint-free wipes and isopropyl alcohol to remove any remaining coating residue and other contaminants.

NOTE: Take care not to pull the boot and spring off of the fibers while cleaning.

4.2 Epoxy Preparation

US Conec recommends use of EPO-TEK 353ND epoxy for all MTP® brand products. However, different cure schedules are required for multimode and single-mode products.

The recommended cure schedule for multimode products is 85°C ($\pm 5^\circ$) for 55 minutes minimum.

The recommended cure schedule for single-mode products is 100°C ($\pm 5^\circ$) for 20 minutes minimum.

4.2.1 Obtain an EPO-TEK 353ND epoxy bi-pak.



4.2.1

4.2.2 Slide the plastic clamp (divider) off of the epoxy bi-pak. Mix thoroughly for approximately 2 minutes until the epoxy has a consistent color throughout.



4.2.2a



4.2.2b

- 4.2.3 Put the mixed epoxy into a 3 cc syringe with a barrel tipped cap installed. Place the syringe into the centrifuge (or other outgassing device) and spin (outgas) for ten (10) minutes.



4.2.3a



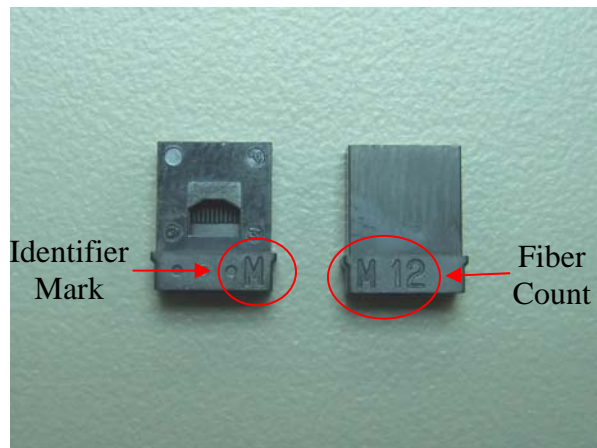
4.2.3b

NOTICE: *Failure to outgas will result in air being trapped in the epoxy. During curing, the air will expand, causing voids which will reduce the adhesive properties of the epoxy. This in turn may result in fiber pistoning, which will adversely affect the optical performance of the connector.*

- 4.2.4 Remove the syringe from the centrifuge and install the plunger into the syringe approximately ½ inch. Invert the syringe and allow the epoxy to thoroughly settle against the plunger.
- 4.2.5 Remove the barrel tipped cap from the syringe and replace with a #25PPS .014 x .50 plastic needle tip. Compress the plunger until all air has been removed from the syringe.



4.2.5



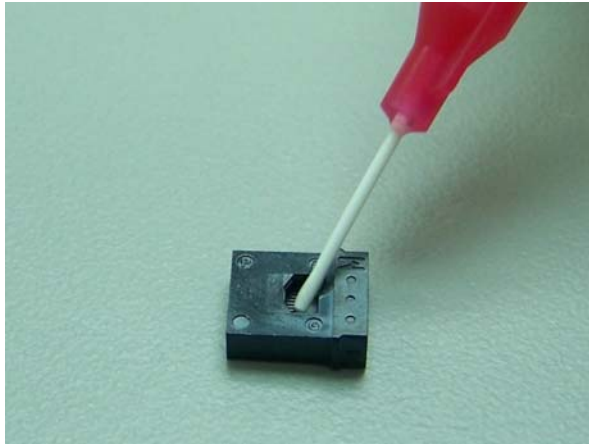
4.3.1

4.3 Ferrule Installation

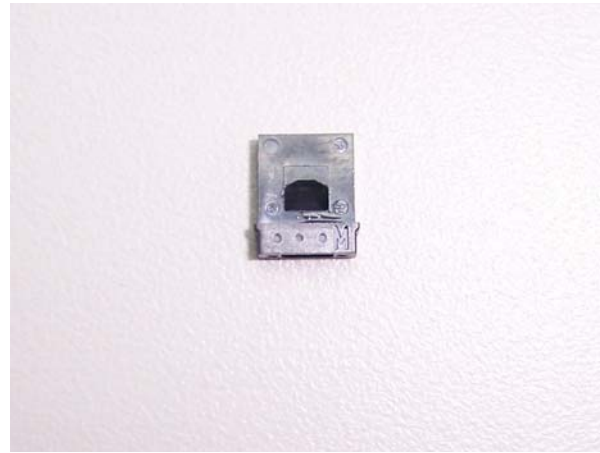
- 4.3.1 Obtain a ferrule for the fiber type and number (4, 8, 12, etc.) you are working with and locate the “M” (multimode), “S” (single-mode), or “E” (single-mode MT Elite®) identifier mark located on the ferrule shoulder in the lower right-hand corner below the window. The fiber count is visible on the back shoulder.

NOTE: Multimode MT Elite® ferrules have an “M” on the window side and an “ME” on the fiber count side.

- 4.3.2 Turn on the vacuum pump with the MT nozzle (P/N 400025-01) installed.
- 4.3.3 Apply epoxy through the front edge of the ferrule window along the fiber u-grooves. Ensure all fiber grooves are covered.



4.3.3a



4.3.3b

- 4.3.4 Place approximately 2 (\pm 1) millimeters of the ferrule, endface first, into the suction nozzle. Continue for approximately 5 seconds or until epoxy has filled all the fiber holes.



4.3.4a



4.3.4b

NOTICE: *Failure to perform the previous step or performing it improperly could yield an inconsistent epoxy bond between the fibers and ferrule material. This may cause fiber pistoning, which will adversely affect the optical performance of the connector.*

After removal from the nozzle, an epoxy bead should be visible on the ferrule endface covering the fiber holes and should remain there through fiber insertion.

CAUTION: Keep the guide pin holes free of epoxy. Epoxy in the guide pin holes will prevent connector mating.

4.3.5 With the #1 (dark blue) fiber aligned with the “M”, “S”, or “E” identifier mark, insert the fibers into the opening in the rear of the ferrule.

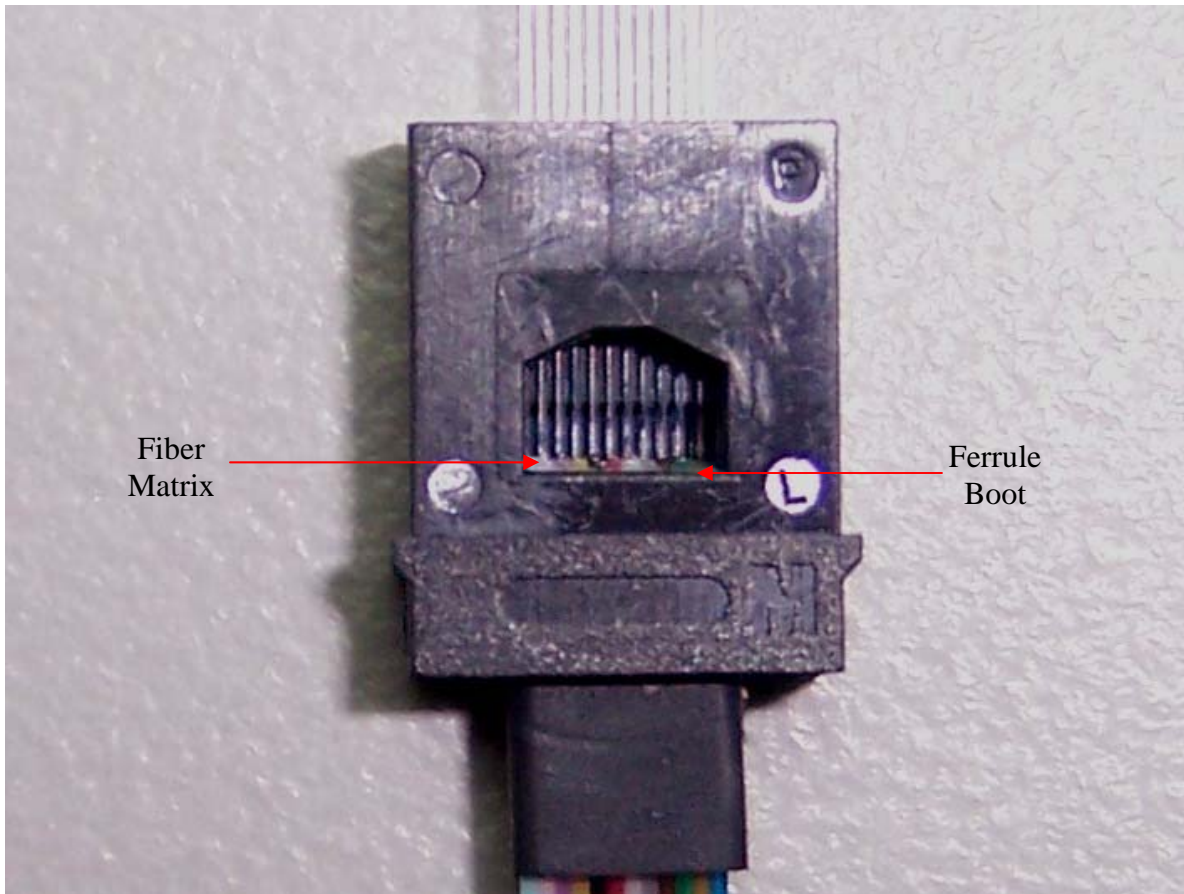
4.3.5.1 Tilt the ribbon slightly. Watch through the ferrule window as the fibers settle into the u-grooves of the shelf. This may be aided by gently moving the fibers within the ferrule window.

4.3.5.2 Slowly push the fibers along the u-grooves and insert them into the fiber holes in the ferrule. The fibers should slide smoothly into the holes and pass through the ferrule end face; however, if any resistance is felt, back out slightly and try again, watching through the window to ensure all fibers are in the proper groove. Any bending of a fiber signifies misalignment and will cause fiber breakage.

4.3.5.3 Push the fibers through the ferrule until 0.5 to 1.0 millimeter of fiber coatings are visible through the window. Do not push the fiber coatings beyond the step marking the end of the guide grooves.

CAUTION: Pushing the edge of the fiber coatings beyond the guide grooves may cause the fibers to break inside the ferrule.

4.3.6 Carefully slide the ferrule boot into the opening in the rear of the ferrule until it stops. When in proper position, the edge of the boot will be visible in the lower edge of the window.



4.3.6

4.4 Ferrule Curing

- 4.4.1 Apply epoxy into the window until the cavity is full and even with the top of the ferrule. Take care that no air pockets are formed inside the ferrule cavity.

NOTICE: Care should be taken not to overfill the cavity as excess epoxy must be removed after curing.



4.4.1



4.4.2

- 4.4.2 Place the ferrules window up into the ports of the US Conec curing oven. Secure the cables under the clamp for that port. Once all connectors to be cured are placed in the oven, close the curing oven lid.

NOTE: Recheck epoxy level after five (5) minutes.

- 4.4.3 Set the oven to the cure schedule for the type of epoxy being used. See US Conec Document # AEN-1809, “US Conec Ferrule Curing Oven Operation” for instructions on setting oven cure time and temperature.



4.4.3

- 4.4.4 After the cure time has elapsed, open the lid and remove the cured connectors. Allow to cool for ten (10) minutes.
- 4.4.5 Scribe the fibers along the epoxy bead. Grasp the fibers between the thumb and forefinger and gently pull the fibers straight away from the ferrule endface. See US Conec Document # AEN-1906, “Recommended US Conec Diamond Usage Procedure” for more information.

5.0 Ferrule Polishing

For ferrule polishing please refer to the polishing equipment manufacturers’ guide for recommended processes or contact US Conec for more information.

See US Conec Document # AEN-1512, “US Conec Recommended Between-Step Cleaning Procedure for Flocked Cloth Polishing of MT Ferrules” for more information on ferrule cleaning during and after polishing.

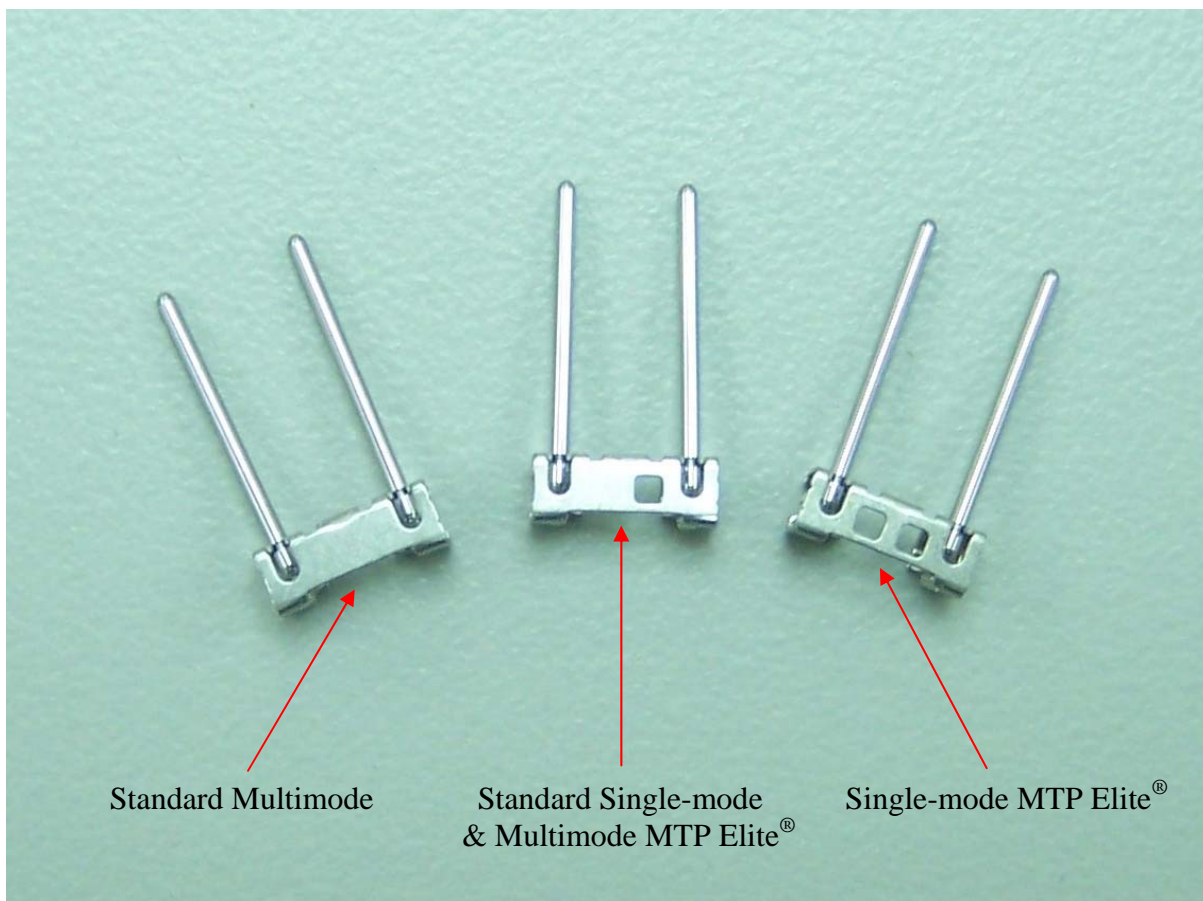
6.0 MTP® Brand Housing Assembly

MTP® brand connectors may be assembled as either males or females.

Male connectors have a pin clamp with guide pins pre-installed. Male pin clamps are available for standard multimode products (no punch-outs, P/N 6042), standard single-mode products and multimode MTP Elite® products (single punch-out, P/N 6043), and single-mode MTP Elite® products (double punch-outs, P/N 6044).

Female connectors have a plastic pin clamp spacer with guide pin stubs (P/N 9386).

Follow the instructions for the type connector you are assembling.



Pin Clamps

6.1 Male Connectors:

6.1.1 Obtain a male pin clamp assembly and position it on the ribbon.

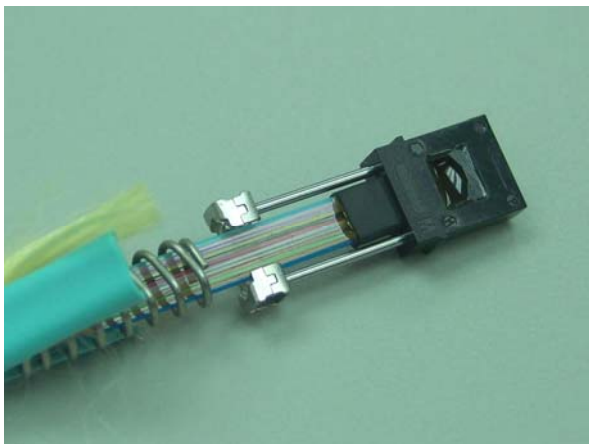


6.1.1a

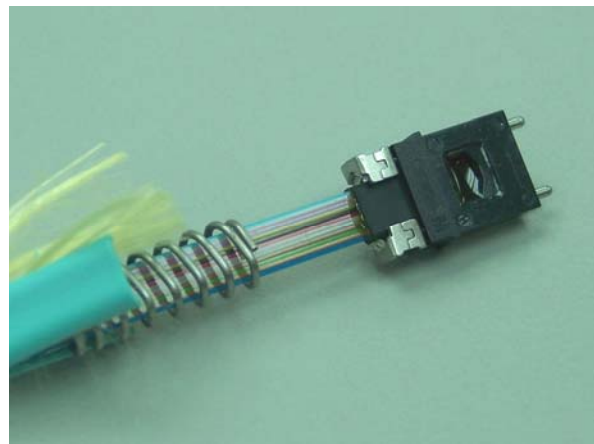


6.1.1b

6.1.2 Insert the guide pins into the holes in the rear of the ferrule. Push the clamp over the ferrule boot and securely against the rear of the ferrule. It is important for the pin clamp to seat securely against the ferrule in order for the housing to assemble properly.

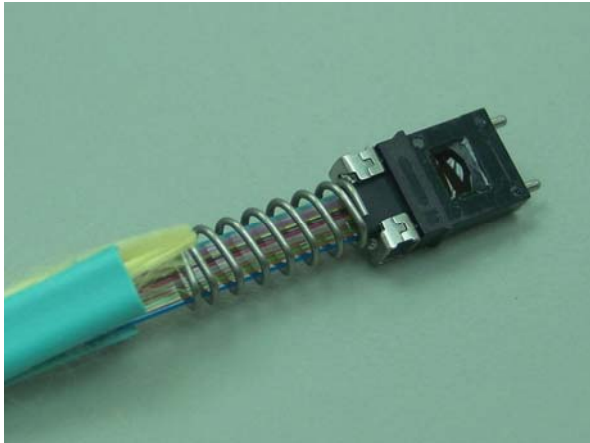


6.1.2a

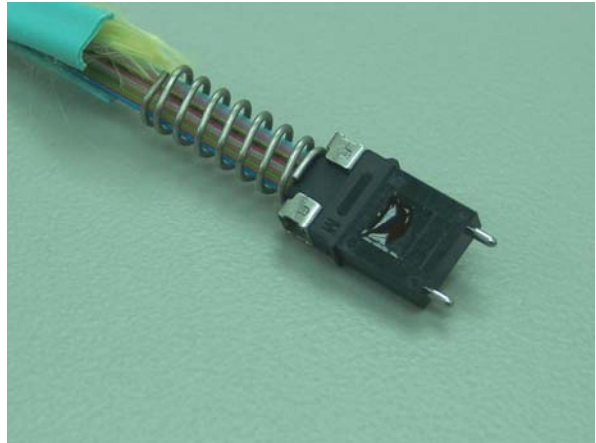


6.1.2b

6.1.3 Slide the spring against the clamp.



6.1.3a



6.1.3b

6.2 Female Connectors:

6.2.1 Obtain a female pin clamp and position it on the ribbon.

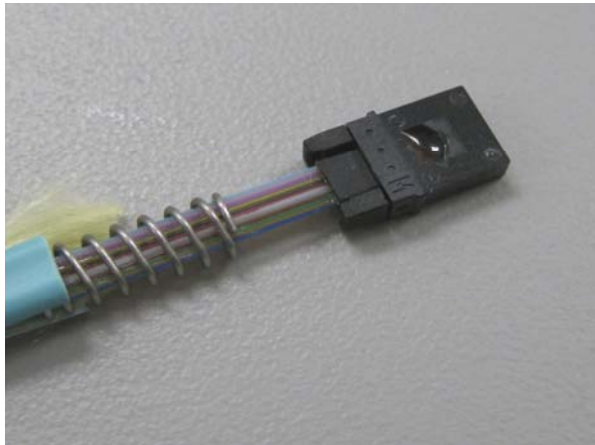


6.2.1a

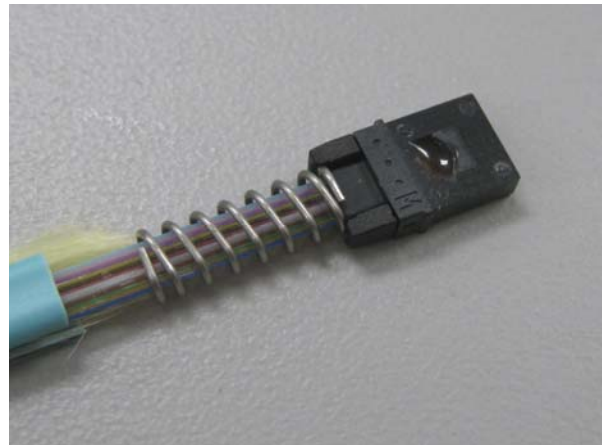


6.2.1b

6.2.2 Insert the guide pin stubs into the holes in the rear of the ferrule. Push the clamp over the ferrule boot and securely against the rear of the ferrule. It is important for the pin clamp to seat securely against the ferrule in order for the housing to assemble properly.



6.2.2



6.2.3

6.2.3 Slide the spring against the clamp and apply a slight pressure in order to hold the clamp in place.

6.3 Housing Installation

62.5μ multimode applications use beige housings (P/N MTP-A12-11)

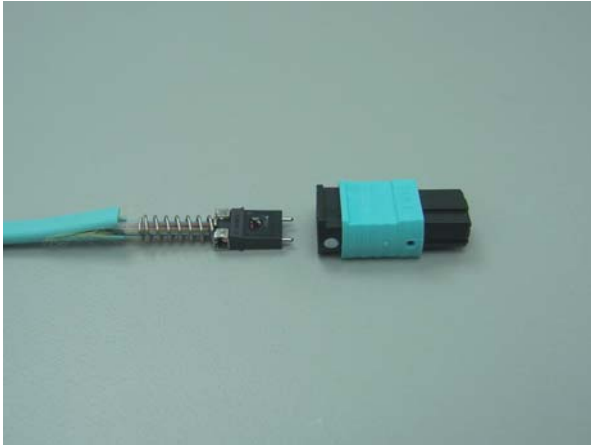
Standard 50μ multimode applications use black housings (P/N MTP-A12-02))

Laser-optimized 50μ multimode applications and multimode MTP Elite® applications use aqua housings (P/N 7871)

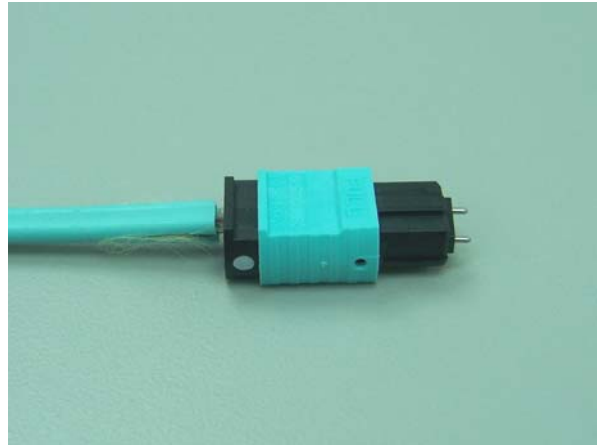
Single-mode 8° angled applications use green housings (P/N MTP-A12-12)

MTP Elite® single-mode angled applications use mustard housings (P/N MTP-A12-15)

6.3.1 Slide the ferrule into the outer housing, making sure the dot on the housing and the identifier mark on the ferrule are aligned. Push the ferrule through the outer housing until it stops with the end face protruding from the housing.

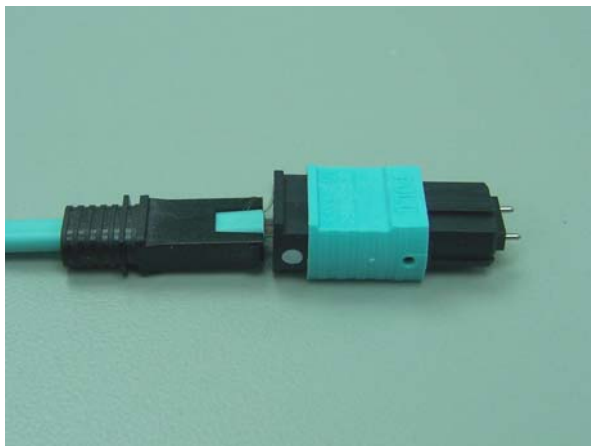


6.3.1a



6.3.1b

- 6.3.2 Slide the spring push against the rear of the housing. Insert the spring push into the housing until the initial resistance is overcome and the spring push is inserted into the housing approximately one-half of the way.



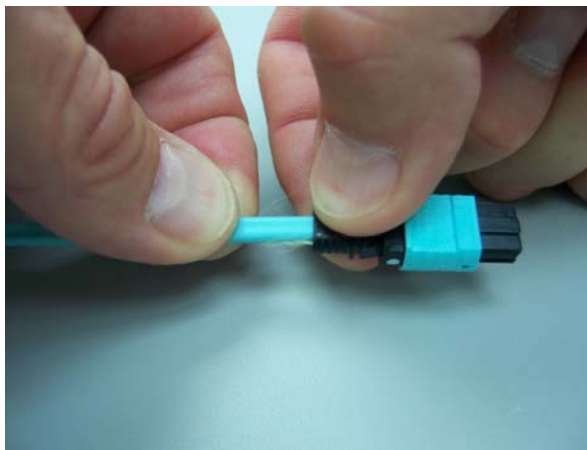
6.3.2a



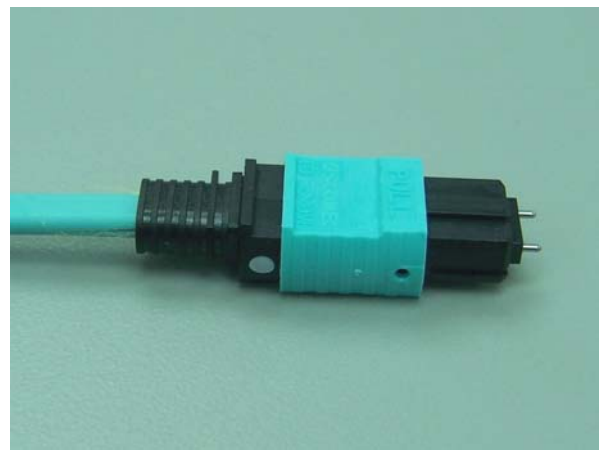
6.3.2b

- 6.3.3 While holding the crimp body (knurled) portion of the spring push/crimp body, pull the cable straight back from the crimp body until the ferrule moves freely up and down within the housing showing there is no binding of the spring, fibers, aramid yarn, and jacket within the housing.

NOTE: *If the ferrule does not move freely within the housing, remove the spring push/crimp body from the housing and inspect the jacket and aramid yarn to insure they are not binding within the housing. Repeat steps 6.3.2 through 6.3.4.*



6.3.3



6.3.4

6.3.4 Once it is determined that the ferrule moves freely within the housing, continue pushing the spring push into the housing until a “click” is heard.

6.4 Connector Crimping

6.4.1 Remove the jacket and aramid yarn from underneath the crimp body portion of the crimp body/spring push. Gently pull the aramid yarn to insure it is tight within the cable jacket.

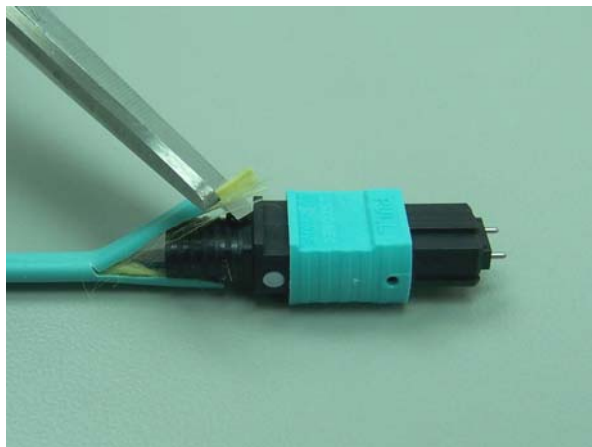


6.4.1

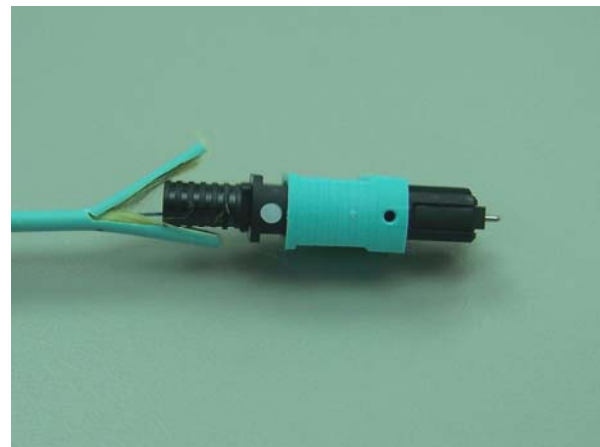


6.4.2a

6.4.2 Evenly distribute the yarn on both sides of the crimp body. If necessary, trim the aramid yarn even with the end of the cable jacket.

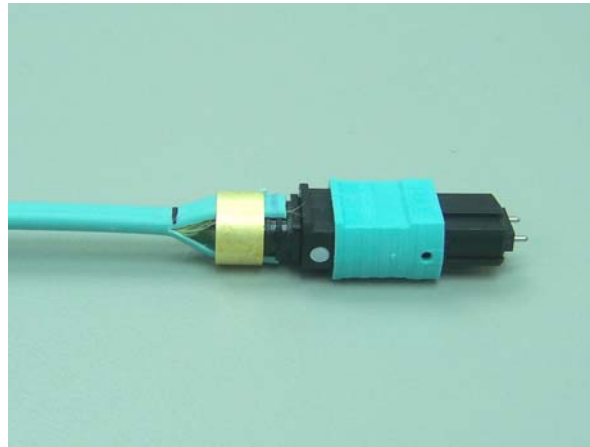


6.4.2b



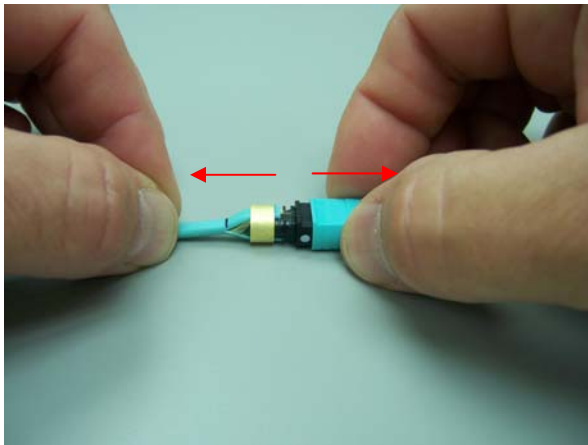
6.4.2c

6.4.3 Slide the crimp band over the crimp body portion of the crimp body/spring push, capturing the cable jacket and aramid yarn between the crimp band and crimp body.

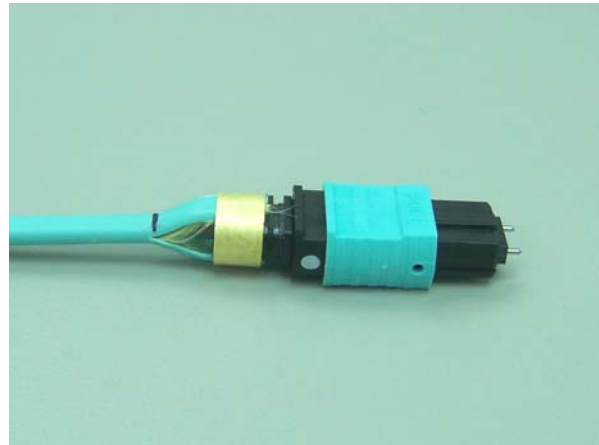


6.4.3

- 6.4.4 Gently pull cable jacket and housing assembly in opposite directions to remove any slack that may be in the ribbon, aramid yarn, or jacket. Position the crimp ring completely against the stop tab located on the crimp body.



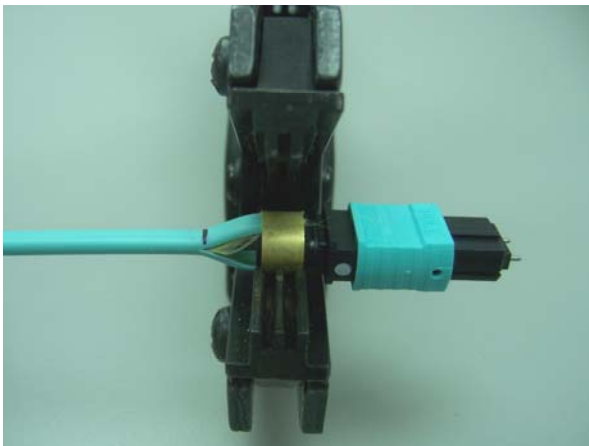
6.4.4a



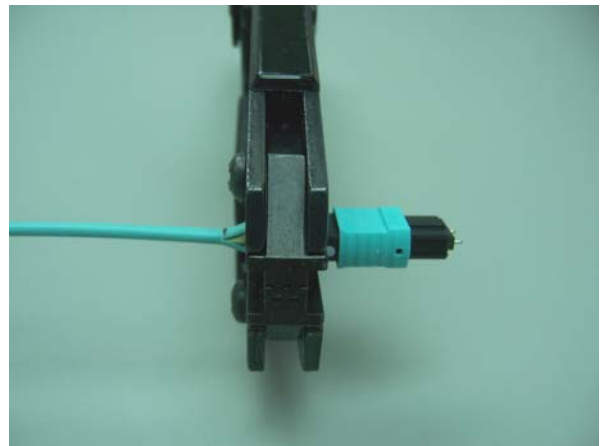
6.4.4b

6.4.5 Crimp the crimp band to the crimp body.

- 6.4.5.1 Place the connector into the cavity of the standard oval MTP® brand crimp tool and die set (P/N 12245). Ensure the crimp band does not slide out of position. Squeeze the handles of the crimp tool together until a click is heard. Release the handles and remove the crimped connector.



6.4.5.1a



6.4.5.1b



6.4.5.1c

6.5 Connector Completion

- 6.5.1 Slide the boot over the crimp band until it seats completely against the back of the crimp body/housing assembly.

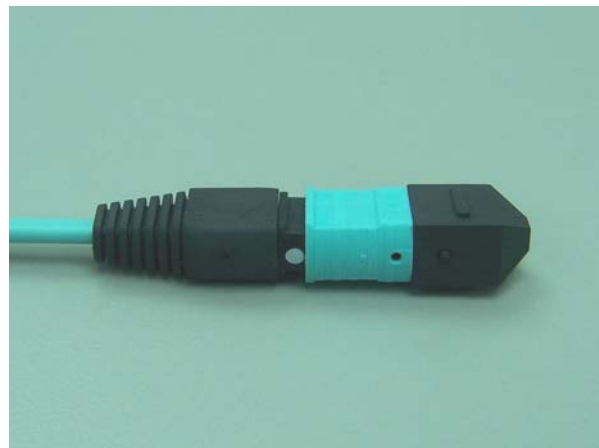


6.5.1

- 6.5.2 Clean the ferrule endface with the OPTIPOP® optical connector cleaner.



6.5.2



6.5.3

- 6.5.3 Install the protective cap over the endface of the completed connector.