



Data Sheet

Fibre optic connectors termination procedure

RS stock nos. 458-948, 458-954, 459-014, 201-1119

1.0 Cable preparation of jacketed fibre

1.1 Amphenol 905 SMA connectors

Before stripping the cable slip the strain relief boot and crimp ferrule on. If using the connector for 2.5mm cable, ensure that the crimp ferrule is slipped onto the cable from its smaller inner diameter end such that its larger inner diameter end butts against the connector.

1.2 Quick Shot ST[®] II connectors

For detailed termination of Quick Shot ST[®] II connectors, use the instructions supplied with the product.

1.3 3M ST[®] compatible connectors

Before stripping the cable slip the black strain relief boot on.

1.4 Cable stripping and fibre cleaning

- a) Prepare the cable to the dimensions shown in Figures 1, 2 or 3 depending on style of connector to be terminated. A fibre optic stripping kit, (RS stock no. 538-870), is available for precision stripping of fibre optic cables. A three-in-one fibre optic stripping tool, (RS stock no. 459-064) is also available for preparation of fibre optic cables. The use of ceramic Kevlar[®] cutters, (RS stock no. 572-549), is recommended for cutting the Kevlar[®] strength members.
- b) Once the cable is prepared clean fibre with lint-free wipes (see Electronic Service Aids Section of your current RS Catalogue) moistened with isopropanol solvent cleaner (see Electronic Service Aids Section of your current RS Catalogue). Do not allow the solvent to soak the Kevlar[®]. Make sure there is absolutely no buffer residue or dust on the fibre by holding it to a light and inspecting the fibre for a smooth shiny surface. Repeat the cleaning process if necessary.

2.0 Preparation of secondary coated (900µm) fibres

3M ST[®] compatible connectors may be mounted to secondary coated (tight buffered) fibre. Strip fibre to dimensions shown in Figure 4. The RS fibre optic stripping tool kit, (RS stock no. 538-870) or three-in-one stripping tool, (RS stock no. 459-064), may be used.

Clean fibre with a lint-free wipe moistened with alcohol (see Electronic Service Aids Section in the current RS Catalogue).

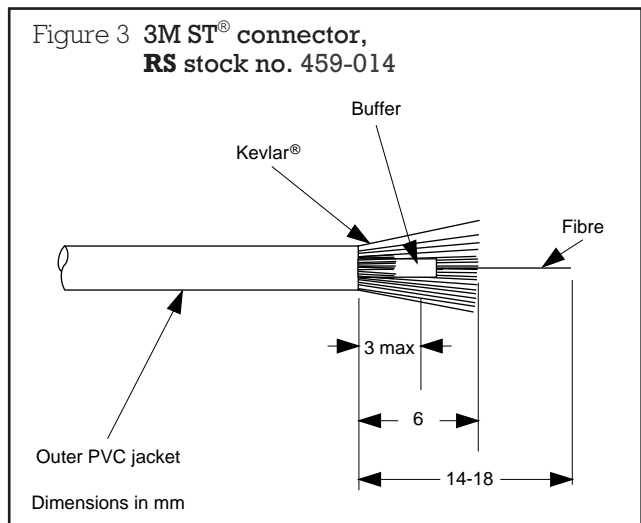
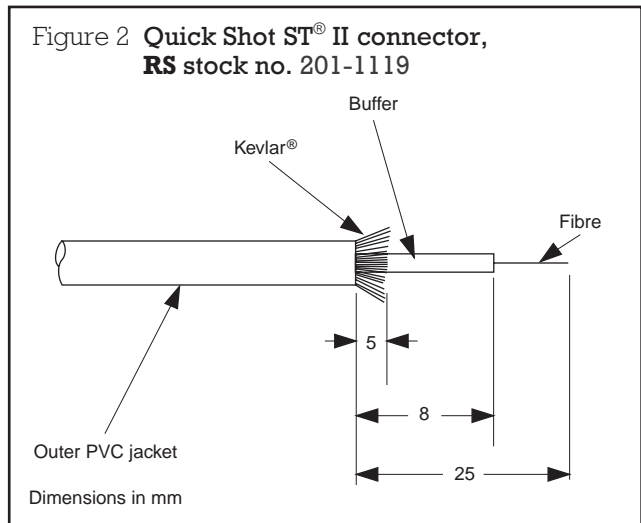
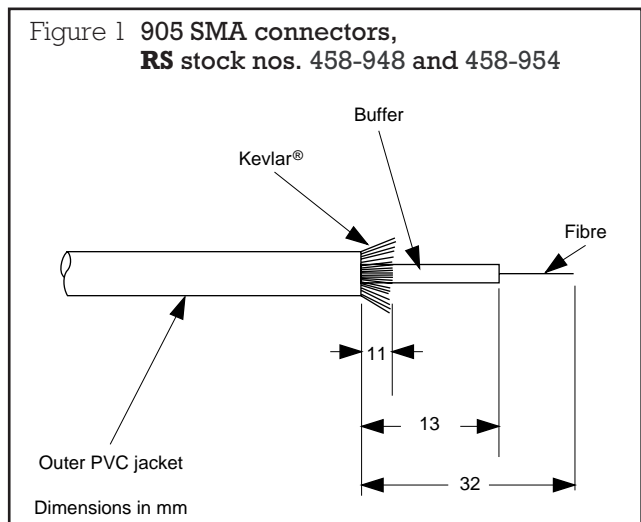
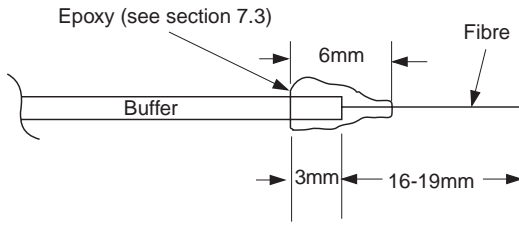


Figure 4 **3M ST® connector,**
RS stock no. 459-014



3.0 Connector inspection prior to termination

Hold the connector up to a light to ensure that the capillary hole of the ceramic ferrule is clean. If the hole is obstructed, blow it clear (see dust remover aerosol, in Electronic Service Aids Section of your current **RS** Catalogue) or use steel cleaning wire (**RS** stock no. 455-179) to unblock the capillary hole.

WARNING: When blowing clear broken fibres from connectors, direct dust remover nozzle away from body and other persons present to minimise risk of injury.

4.0 Dry fit the connector onto the fibre

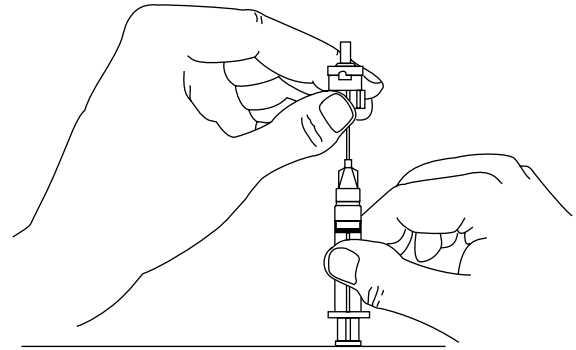
Before applying epoxy, check the 125µm connector for fit on the fibre. Line up the connector straight with the fibre and thread it onto the fibre while slightly rotating the connector between thumb and forefinger. Once the fibre is seen at the ceramic tip, remove it from the connector. If the connector cannot be threaded onto the fibre, inspect the fibre and connector and reclean if necessary.

5.0 Loading the connector with epoxy

Follow the epoxy mixing instructions. If using EPO-TEK 353ND, (**RS** stock no. 459-137), remove the bi-pack from the foil envelope and remove the two piece plastic clip. Placing the bi-pack over the edge of the table, use a back and forth motion to thoroughly mix the epoxy together. When thoroughly mixed cut a small corner off the pack and squeeze the contents into a syringe (**RS** stock no. 514-717) with the plunger removed. Insert the plunger back into the syringe and holding the syringe vertically on a benchtop, place the connector onto the dispensing tip (Figure 5) until it seats positively. Apply downward pressure on the connector and syringe until a bead of epoxy appears on the end of the ceramic tip. Continue to inject epoxy until the head covers about half the flat surface of the ceramic tip. Release the pressure on the connector and plunger, wait five seconds, and then remove the syringe. Apply a thin coat of epoxy evenly around the inside wall of the backbone of the connector using the syringe.

Note: Excessive epoxy within the connector may adversely affect the performance of the termination.

Figure 5



6.0 Apply epoxy to the outer jacket and fibre

Coat the circumference of the outer jacket with a thin layer of epoxy starting from the stripped edge of the jacket extending to 3mm up the cable jacket. Also coat the fibre with a thin layer of epoxy starting at the edge of the buffer extending to 3mm up the fibre.

7.0 Connector mounting and crimping

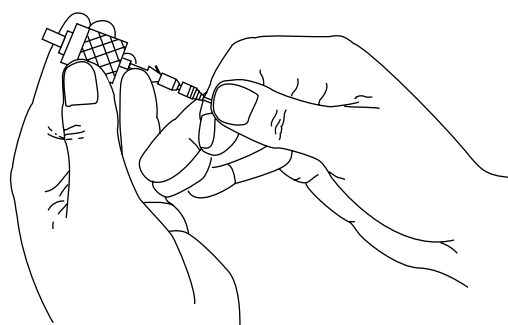
7.1 Assembly instructions for mounting Amphenol 905 SMA connectors to jacketed fibre

Fibre insertion

- a) Hold the connector and cable as shown in Figure 6 and insert the fibre carefully into the connector until 6mm of fibre protrudes. Slight rotation of the connector may assist the insertion.

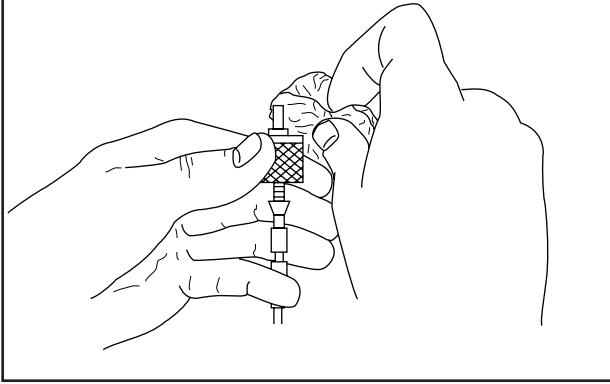
Note: It may be helpful to place both elbows on the work surface for support and stability.

Figure 6 **Rotate the connector slightly to ease fibre insertion**



- b) Holding the connector and cable in one hand as shown in Figure 7, back the fibre slowly out of the connector until the tip of the fibre is just inside the ferrule. With the other hand, thoroughly clean any and ALL epoxy from the face of the ferrule with a dry wipe. Once cleaned, fully insert the fibre with a slow and continuous motion. Epoxy should be absent from the ferrule surface upon completion of this step. With the edge of a wipe, also remove any epoxy remaining on the fibre near the ferrule surface.

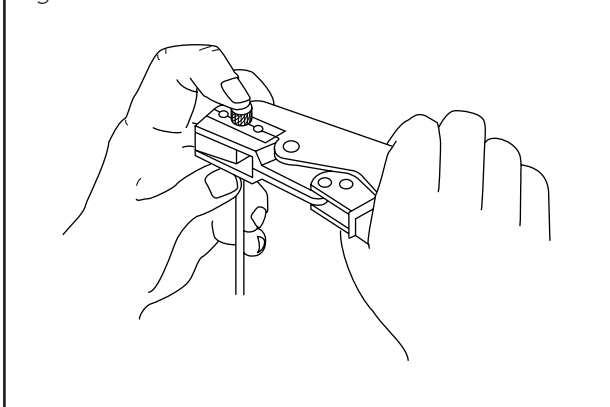
Figure 7 Wipe any epoxy from the face of the ferrule



Crimping

- c) With the dispensing tip of the syringe, apply one drop of epoxy to the knurled portion of the rear body and pull any Kevlar® strength members from under the connector body to distribute them evenly around the connector body. Slide the crimp ferrule up onto the rear portion of the connector over the strength members until it seats just under the coupling nut. Hold the connector with four fingers and apply light downward pressure to ensure that the connector is fully seated onto the buffer (Figure 8).
- d) Using crimp tool (RS stock no. 472-017) and die set (RS stock no. 459-339) crimp the entire length of the ferrule with the cavity marked 905 SMA.
- e) Apply a drop of epoxy to the strain relief boot end and slip it over the crimped sleeve to butt against the connector body.
- f) The connector is now ready to be placed in a suitable curing oven, (RS stock no. 201-1125) in conjunction with heatsinks (RS stock no. 201-1169), (See Datacommunications Networking Products Section of your current RS Catalogue).

Figure 8



7.2 Assembly instructions for mounting 3M ST® – compatible connectors to jacketed fibre

Fibre insertion

- a) Coat the circumference of the outer jacket with a thin layer of epoxy starting from the stripped edge of the jacket and extending 3mm on the jacket. Also coat the exposed fibre with a thin layer of epoxy starting at the edge of the buffer and extending 3mm up the fibre.

- b) Hold the cable in one hand about 20mm from the edge of the outer jacket and hold the connector in the other hand. Rest your hands on the table or against each other and carefully thread the connector (backbone first) straight onto the fibre. Slightly rotate the connector between thumb and forefinger in order to ease the funnelling of the fibre into its guide hole in the ferrule.
- c) While rotating, maintain a continuous, light inward pressure to assist entry alignment. Slowly slide the connector onto the cables outer jacket until it bottoms out. As this is done, the Kevlar® strands should flare out evenly and disappear into the backbone of the connector. Check for fibre breakage by slightly pulling back and pushing forward on the cable while watching for fibre movement.
- d) Looking at the tip of the ferrule, examine the epoxy surrounding the protruding fibre. The correct epoxy bead height should be between 2 and 4 fibre diameters.(0.25 to 0.50mm) above the ceramic tip. If this is not the case, additional epoxy must be applied around the fibre base to build the bead to the proper height. A short piece of buffered fibre with about 6mm of exposed fibre makes a good applicator.

Note: If the fibre was stripped short, it may not be visible above the epoxy bead. Holding the connector in one hand, use a slight inward pressure on the cables outer jacket and inspect the epoxy bead making sure that the fibre extends beyond the ferrule.

WARNING: The outside diameter of the ceramic ferrule must be free of epoxy.

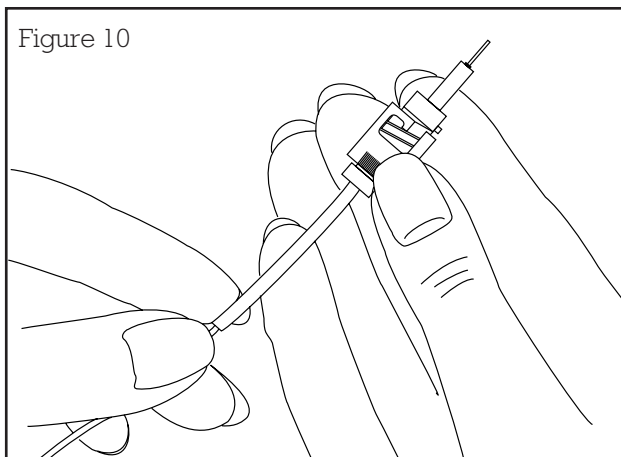
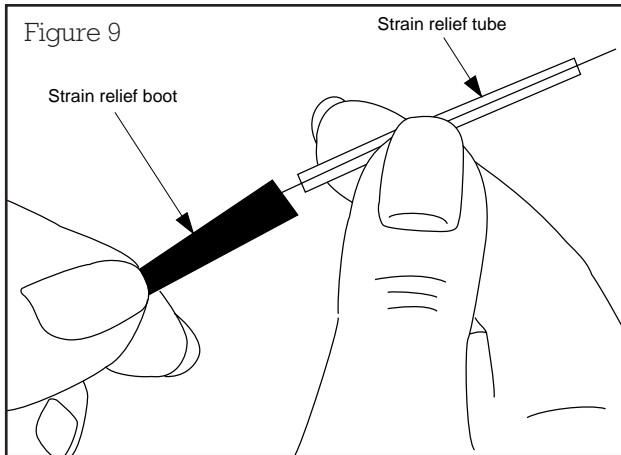
Crimping

- e) Wipe away any excess epoxy from the backbone and cable. Using the crimping tool, (RS stock no. 472-017) and die set (RS stock no. 459-339), tightly crimp, using the cavity marked '3M ST®', only the raised portion at the very end of the connector backbone onto the cables outer jacket while maintaining an inward pressure on the cable. The crimp tool must be closed completely before it will release. Keep the crimp tool jaws free of hard epoxy.

Note: Cable with a jacket diameter of 2.5mm will require an insert adaptor that reduces the diameter of the connector hole to accommodate the smaller cable.

- f) Apply a very thin layer of epoxy around the leading edge of the crimped area of the backbone. Slide the boot over the crimped area of the backbone and rotate it to evenly distribute the epoxy. The connector is now ready to be inserted into a suitable curing oven (RS stock no. 201-1125) (see Datacommunications/Networking Products Section of your current RS Catalogue).

7.3 Assembly instructions for mounting 3M ST[®] compatible connectors to bare (secondary coated/tight buffered) fibre



- Slip the strain relief boot onto the buffered fibre, small end first (Figure 9).
- Slip the strain relief tube onto the buffered fibre (Figure 9).
- Remove buffer coating to dimensions shown in Figure 4, using Fibre-optic stripping kit (RS stock no. 538-870) or Three-in-One stripping tool (RS stock no. 459-064).
- Clean the fibre with a lint free wipe dampened with alcohol (see Electronic Service Aids Section of your current RS Catalogue).
- Follow instructions outlined in Section 3.0 to Section 5.0. Apply epoxy to the connector backbone and fibre.

WARNING: Too much epoxy in the backbone may cause epoxy 'wicking up' the strain relief tube.

- Apply a coating of epoxy on the buffer extending 3mm down from the base of the bare fibre. Also coat the exposed fibre with a thin layer of epoxy starting at the edge of the buffer and extending 3mm up the fibre (Figure 4).
- Follow step 7.2b.
- While rotating and maintaining a continuous, light inward pressure to assist entry alignment, slowly slide the connector on to the strain relief tube until it bottoms out and the buffer seats at the base of the ceramic ferrule (Figure 10). Check the fibre for breakage.
- Examine the epoxy bead.

k) Tightly crimp only the raised portion at the very end of the connector backbone onto the strain relief tube while maintaining an inward pressure on the tube and buffer. Use crimp tool (RS stock no. 472-017) and crimping die set (RS stock no. 459-339).

l) Follow step outlined in section 7.2f.

m) When placing the connector into a curing oven, hold the connector by the end of the strain relief boot until the heat sink (RS stock no. 201-1153) seats in the bottom of the oven cavity. Do not hold the buffered portion of the fibre. Check to see that the buffered fibre is fully seated after it has been placed in the oven.

8.0 Epoxy curing

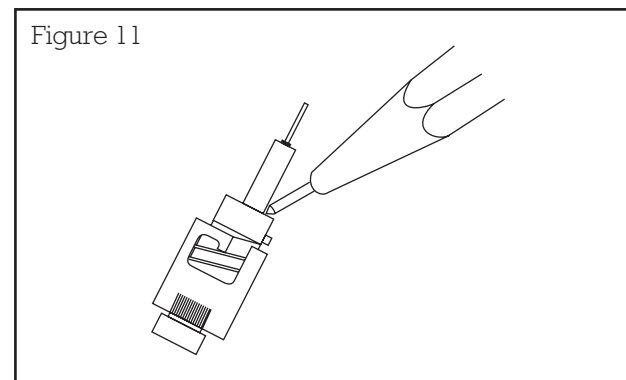
A suitable curing oven (RS stock no. 201-1125), specifically designed for epoxy curing of fibre optic connectors, is available with appropriate SMA or ST[®] style heatsinks. Full instructions are supplied with the oven but in order to achieve successful terminations, it is recommended that curing instructions supplied by the epoxy manufacturer/supplier are followed.

9.0 Cleaving

A suitable diamond tipped scribe (RS stock no. 542-087) is available for cleaving the optical fibre protruding from the end of terminated connectors. The following instructions should be followed for scoring and cleaving the fibre.

Allow the connector to cool to room temperature before scoring.

Hold the connector in a vertical position with the fibre pointing upwards. Lightly score the fibre, using the scoring tool, just above the epoxy bead through which the fibre protrudes.



Using the scoring tool, gently press against the fibre from the scored side until it breaks along the score mark. It is not necessary to press hard.

If the fibre does not break easily, scoring must be repeated.

Caution: Provisions should be made for the collection, storage and disposal of all fibre offcuts in a manner which is designed to reduce the risk of personal injury.

10.0 Polishing

10.1 905 SMA connectors

Figure 12

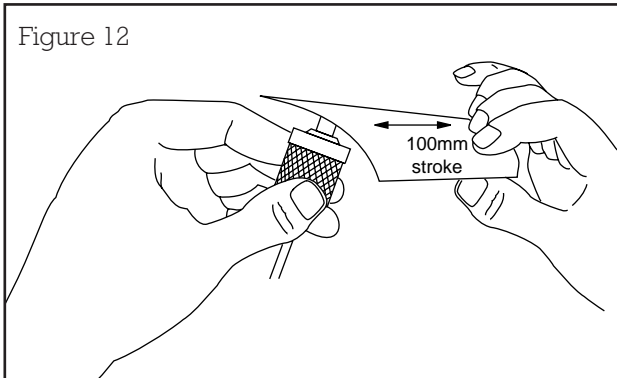
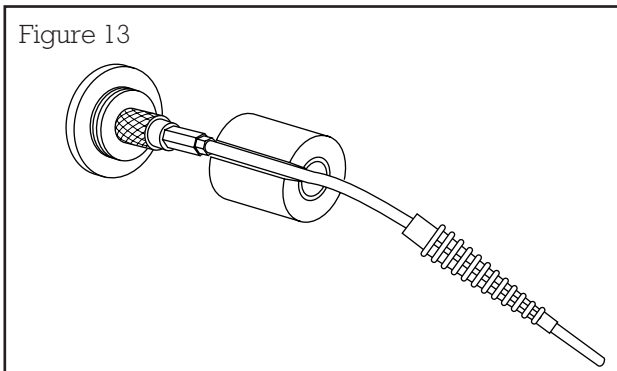


Figure 13

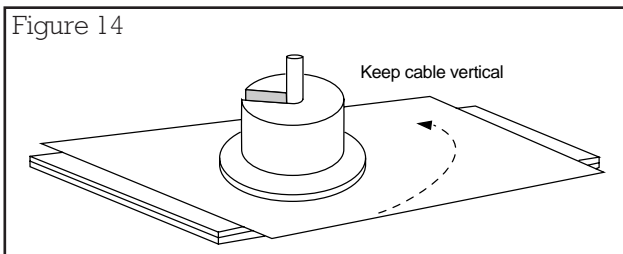


- a) Holding the connector in one hand, arch a strip of 30 micron lapping paper (**RS** stock no. 459-323) in the other. Move the paper across the connector, back and forth as shown in Figure 12, to remove any sharp burrs from the cleaved fibre.

Use only the weight of the paper as pressure.

- b) Replace the 30 micron polishing paper with a strip of 12 micron polishing paper (**RS** stock no. 459-171), complete **very gently and with very little pressure**, 10 to 15 circular strokes, 1 to 5 mm in diameter, over the ferrule end until only a small, barely visible amount of fibre is left.
- c) Install the connector into the constant force polishing fixture (**RS** stock no. 459-317) and polishing tool (**RS** stock no. 458-976) (Figure 13). If the connector is assembled into the polishing tool correctly, slight pressure of the ferrule (be careful not to touch the fibre) with the thumbnail should result in a spring action. If this is not the case, the connector should be removed and re-inserted.

Figure 14



- e) The final polish of the connector face is achieved by placing the polishing jig on 0.3 micron lapping paper (**RS** stock no. 459-143) placed on a smooth hard surface (Figure 14) and using a 'figure-of-eight' motion of about 100mm to polish the ferrule end face (Figure 16). Clean the paper with a dry cloth after every connector and replace it every 4 to 5 connectors.

- f) Remove the connector from the jig and clean using lint free wipes dampened with alcohol (see Electronic Service Aids Section of your current **RS** Catalogue). Check using finger nail that no fibre is protruding from the ferrule face. If fibre is still present, the final polishing stage must be repeated.

Figure 15

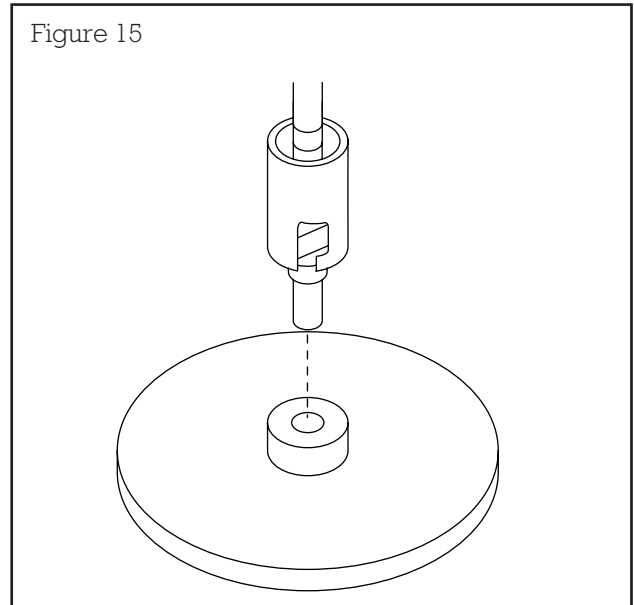
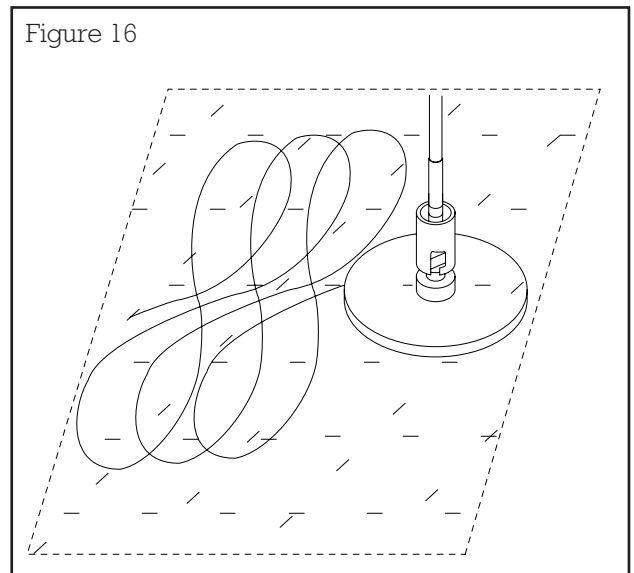


Figure 16



Once polishing and inspection (see Section 11.0) are complete, the strain relief boot can be slipped over the crimped ferrule at back of the connector.

10.2 3M ST® – Compatible connectors

- a) Clean the surface of a soft polishing pad (**RS** stock no. 455-163) with a lint free cloth dampened with isopropyl alcohol (see Electronic Service Aids Section of your current **RS** Catalogue). Blow clean both sides of a sheet of 5 micron polishing paper (**RS** stock no. 459-165). Place the paper shiny side down onto the soft pad.
- b) Wipe the polishing surface of the jig with a lint free cloth moistened with alcohol. Blow the entire jig clean using compressed air duster (see Electronic Service Aids Section of your current **RS** Catalogue). Clean the connector with compressed air only, since wiping it may break the fibre.
- c) While holding the polishing jig in your hand, insert

the connector (Figure 15) so that the ferrule end does not protrude past the bottom of the polishing jig. This is to ensure that the extended fibre from the ferrule will not be broken off below the epoxy level upon initial contact with the polishing paper.

Note: If the connector does not fit easily into the jig, examine the sides of the ceramic ferrule for epoxy. Any excess epoxy can be removed with a scalpel (RS stock no. 850-085).

While holding both the connector and the polishing jig in one hand, slowly place the jig on the polishing paper and begin to polish in a 'figure-eight' motion (Figure 16) without applying pressure on the connector. Light scratch marks should begin to appear on the paper surface.

Continue to polish until the fibre is flush with the epoxy bead (approximately 6 'figure-eights'). Once the fibre is supported by the epoxy bead, begin applying light pressure on the connector while polishing in a 'figure-eight' motion. Continue to polish on the 5 micron polishing paper until a thin layer of epoxy remains on the ceramic tip. Stop when the thickness is about 25 microns and the outer edges of the epoxy layer start to break up and feather. This can be seen using an eye glass.

Notes: 1. If epoxy bead is too large, polishing time can be reduced by using a coarser grit of polishing paper such as 12 micron paper (RS stock no. 459-171), before using the 5 micron paper.

2. The 5 micron polishing paper can be cleaned with alcohol and blown dry for reuse. The sheet can be used to polish 2 to 4 connectors.

Using an alcohol dampened lint-free cloth, clean the ferrule, the polishing jig, and the 5 micron polishing paper. Blow all pieces dry with the compressed air.

Clean one sheet of 1 micron polishing paper (RS stock no. 459-159), and place it directly on the 5 micron polishing paper, both sheets shiny side down on the polishing pad.

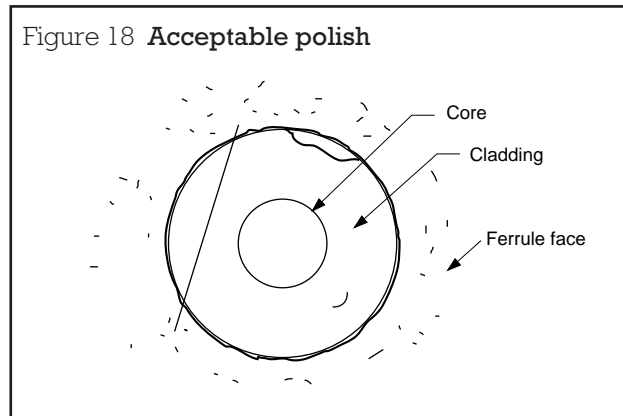
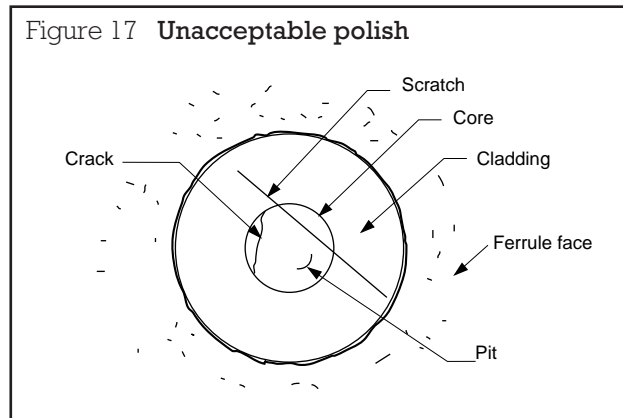
Place three or four drops of water on the 1 micron polishing paper.

e) Insert the ferrule into the jig and lower it gently on to the moistened 1 micron polishing paper.

Lightly polish until all of the epoxy is removed (15 to 20 'figure-eights'). Inspect with the eye glass.

Do not over use the 1 micron polishing paper. Always attempt to polish on fresh areas of the paper. After the entire surface of the paper has been used it can be cleaned with alcohol and reused to polish several more connectors and then discarded. If deep scratches appear on the fibre, discard the 1 micron paper at that time.

f) After polishing, remove the connector from the polishing jig and clean the ferrule. The connector is now ready for inspection.



11.0 Inspection

Using the appropriate SMA or ST[®] adaptor, insert the connector into the Priorspec II Inspection Microscope (RS stock no. 407-7802). The microscope is supplied with full operating instructions which should be followed in order to inspect the fibre end of the connector.

Figures 17 and 18 show examples of an acceptable and unacceptable polish as viewed under the microscope. An acceptable polish will show the core free of any imperfections. In an unacceptable polish, the core would have pits, scratches, cracks, or would be altogether dark. Upon viewing a poor polish, see Section 12.0 on Fault and Diagnosis.

12.0 Fibre optic termination diagnosis chart

Fault	Possible cause	Solution
Fibre fracture or cracking Investigate	Brittle fibre Heat curing schedule too fast Thermal shock Poor cleave (causing propagation of fracture down fibre). Polishing procedure too harsh e.g. pressing down too hard Air bubble adjacent to fibre. Air cavities in ferrule barrel caused by improper filling or curing in upright position (instead of inverted) allowing epoxy to drain back.	Investigate fibre source Lower temperature of cure Gradually increase temperature to attain curing temperature Improve cleaving technique, state of cleaving tool Careful 'blending' of fibre pip into epoxy meniscus needed. Lighten pressure on polishing (refer to termination instructions) Degas epoxy Degas epoxy. Cure in inverted position
Chipping of fibre or cladding (see also above)	Epoxy not fully cured and not supporting fibre during polishing Air bubble adjacent to fibre	Check cure schedule (re-cure if necessary) Degas epoxy
Fibre grow out	Low adhesion of epoxy to fibre caused by: Contaminants on fibre surface Incorrectly cured epoxy Unsuitable epoxy (for that fibre)	Review cleaning procedure Check cure schedule Check recommended epoxy
Scratches on fibre	'Contaminated' polishing paper or worn polishing paper	Change polishing paper
No Light through fibre core	Fracture in fibre somewhere along cable length Fracture in body of connector	Investigate by looking for external markings/kinks in cable See 'Air cavities' above

13.0 Final cleaning

- Blow the PVC dust cap supplied with the connector with compressed air using **RS** dust remover (see Electronic Service Aids Section of your current **RS** Catalogue).
- Wipe the ceramic ferrule with an alcohol dampened lint-free cloth (see Electronic Service Aids Section of your current **RS** Catalogue for suitable alcohol and lint-free cloth). Be sure to wipe the entire length of the ferrule and the ferrule tip.
- Blow the ferrule with compressed air.
- Immediately cover the ferrule with the dust cap.

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