BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 9.30

PRODUCTION PROCESS STANDARD

Fabrication of Learjet 45 Electrical Wire Harnesses

Issue 8
- This standard supersedes PPS 9.30, Issue 7.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- This PPS is effective as of the distribution date.
- Validation of issue status is the responsibility of the user.

- This standard specifies manufacturing processes which are critical to the lightning protection and Transport Canada certification of Bombardier aircraft.
- It is imperative that the procedure specified herein be strictly adhered to.
- The current issue of this PPS and any subsequent revisions to the procedure and requirements specified herein must be authorized by an undersigned Transport Canada design approval designee (DAD).

P. Bootsma (Peter Bootsma, DAD 212) March 7 2017.
Lightning/EMI/HIRF

Approved By: Kim Quan for (Bruce Campbell) March 8, 2017
Materials Technology

(Stephen Pitt) MAR 23, 2017
Quality

Prepared By: (Michael Wright) March 7, 2017
Core Methods - PPS

Issue 8 - Summary of Changes (over the previous issue)

The following summaries are not detailed and are intended only to assist in alerting PPS users to changes which may affect them; refer to the applicable section(s) of this PPS for detailed procedure and requirements.

- Replaced reference to PPS 9.04 for preparation of overbraid and convoluted tubing with a specified procedure.
- Replaced reference to PPS 9.04 for installation of band clamps with specified equipment and procedure.
- Deleted reference to “Icore” in association with 151976 transition adapters.
- Deleted reference to “Deutsch” in association with DMC-MD connectors.
- Added to the Safety Precautions section a statement regarding the safety precautions in general, explaining that the safety precautions specified are specific to Bombardier Toronto (de Havilland).

Table of Contents

Sections **Page**

Table of Contents

Sections **Page**

Tables

1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for fabrication of Learjet 45 electrical wire harnesses.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 General

3.1.1 Unless a specific issue is indicated, the issue of the reference documents specified in this section in effect at the time of manufacture shall form a part of this specification to the extent indicated herein.

3.2 Bombardier Toronto (de Havilland) Process Specifications0

3.2.1 PPS 9.04 - Assembly and Installation of Electrical and Electronic Wire Assemblies.

3.2.2 PPS 9.19 - Automatic Crimping of Size 16 - 22 Electrical Contacts.

3.2.3 PPS 9.22 - Assembly of Connectors.

3.2.4 PPS 9.36 - Manual Crimping of Size 12 - 22 Contacts.

3.2.5 PPS 10.16 - Installation of Heat Shrinkable Tubing, Tape and Sleeves.

3.2.6 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 Band clamps as specified by the engineering drawing.

4.1.3 Knitmesh, 20 mm wide, Glenair #688-113-C 20.

4.1.4 Braided nylon lacing tape to MIL-T-43435 Type I, Finish B, Size 2.

4.1.5 Filler tape, fire resistant - Freudenberg-NOK Inc. #52672 Guideline tape or insulation tape to A-A-59163 (e.g., Freudenberg-NOK Inc. #50215).

4.1.6 Teflon tape to DSC 91-3.

4.1.7 Heat shrinkable sleeving to M23053/5.

4.2 Equipment

4.2.1 Strap wrench, (e.g., Daniels BT-BS-601 or Glenair TG70).

4.2.2 Torque wrench complete with square drive capable of fitting in the square receptacle of the strap wrench specified in para. 4.2.1. Ensure that the torque wrench is re-calibrated to take into account any extension in length caused by the attachment of the strap wrench. The re-calibrated torque wrench must be capable of accurately measuring a torque of 30 in-lbs (i.e., 30 in-lbs should be near the middle of the re-calibrated tool's range).

4.2.3 Conduit expansion tooling as specified in Table 1.

Table 1. Conduit Expansion Tools

Conduit	Expansion Tool	Conduit	Expansion Tool
200157-0012	E 180212-0002	Z1221A00	T-12-B
200157-0016	E 180212-0003	Z1421A00	T-14-B
Z0621A00	T-06-B	Z2021A00	T-20-B
Z0921A00	T-09-B		

4.2.4 Soft jaw pliers (e.g., Daniels BT-SJ-468).

4.2.5 Flush cutters (e.g., Hakko HJ3016t), small sharp scissors, or a razor knife.

4.2.6 Hot tweezer, wire insulation stripping tool.

4.2.7 Band clamp installation tools as specified by the band clamp manufacturer (e.g., Glenair #600-058 tools for installing B0816037-052 / Glenair 600-052 and B0816037-052-1 / Glenair 600-052-1 standard length bands, and B0816037-090 / Glenair 600-090 and B0816037-090-1 / Glenair 600-090-1 extended length bands.

4.2.8 Band clamp installation tool calibration kits as specified/recommended by the band clamp installation tool manufacturer (e.g., Glenair 601-200 for calibration of Glenair band clamp installation tools). Use the applicable band clamp calibration kit to calibrate band clamp installation tools according to the manufacturers' instructions.

5 Procedure

5.1 General

5.1.1 Refer to PPS 9.19 or PPS 9.36, as applicable, for the termination of wires with contacts.

5.1.2 Overbraid shields and individual wire shields are used to protect electrical wire bundles from electro-magnetic effects. Junctions exist within the overbraid when 2 or more branches intersect. Overbraid shields must be secured mechanically and electrically at junctions and terminations. Individual shields must be terminated as specified on the engineering drawing.

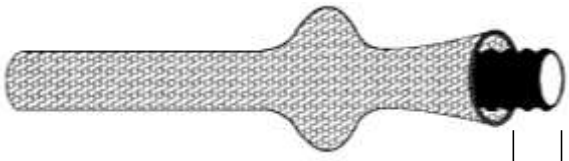
5.1.3 Assemble contacts to connectors according to PPS 9.22.

5.1.4 Prepare the wire loom for termination as specified in PPS 9.04.

5.2 Preparation of Inner Convoluted Tubing and/or Overbraid Shields for Termination

5.2.1 Prepare overbraid shields by cutting the overbraid shield (and inner convoluted tubing, as applicable) to length using small scissors. Ensure the trimmed end is cut cleanly and evenly. Ragged or uneven trimming is **not** acceptable. Allow sufficient length for assembly to terminating hardware.

5.2.2 Where the overbraid shield includes inner convoluted tubing, pull back the overbraid shield from the inner convoluted tubing for a distance of approximately 2" and trim back the inner convoluted tubing (by approximately 1/2", unless otherwise specified) using a straight razor as shown in the adjacent figure:

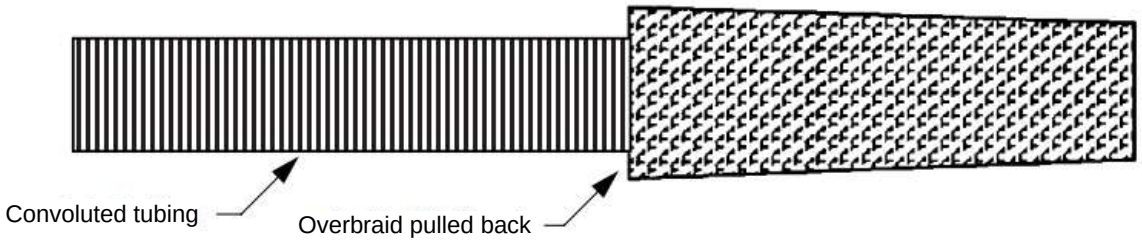


5.3 Termination of Overbraid Shields and Convoluted Tubing at Transition Adaptors (P/N 151976)

5.3.1 Terminate the overbraid shield and convoluted tubing at transition adaptors as follows:

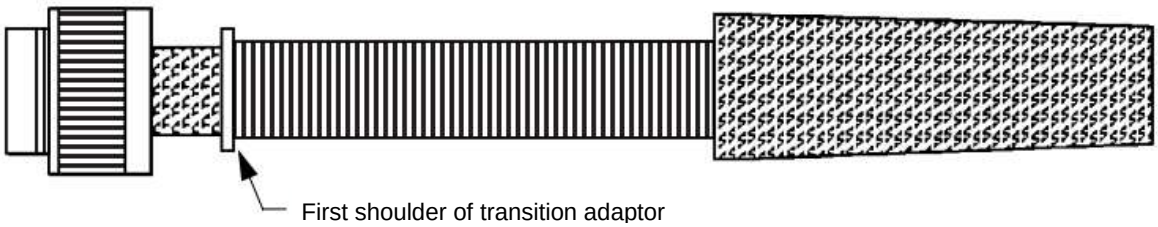
Step 1. Prepare the overbraid shield and convoluted tubing for termination according to section 5.2.

Step 2. Pull back the braid to expose approximately 6" of the convoluted tubing. Use masking tape to hold it temporarily in place as shown:

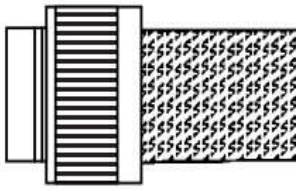


Step 3. Using the appropriate expansion tool (ref. Table 1), expand the inner convoluted tubing end enough to start threading in the transition adaptor.

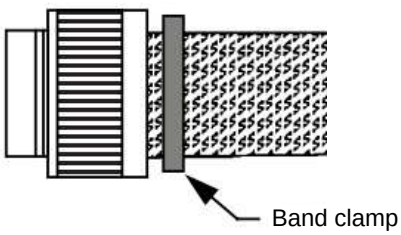
Step 4. Screw the adaptor into the inner convoluted tubing of the overbraid shield until the convoluted tubing covers the threaded tailform and meets the first shoulder of the transition adaptor as shown below:



Step 5. Remove the tape and pull the overbraid over the knurled portion of the adaptor as shown in the adjacent figure:



Step 6. Secure the overbraid to the transition adaptor using a band clamp according to section Step 5, as shown in the adjacent figure:

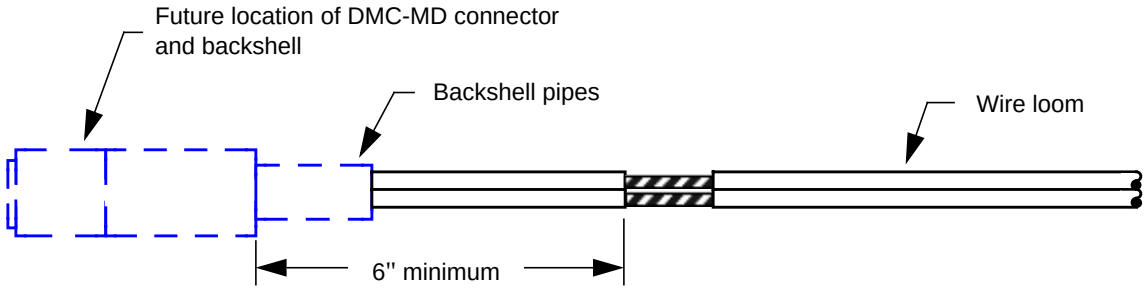


5.4 Termination of Overbraid Shields and Individual Wire Shields at DMC-MD Connectors

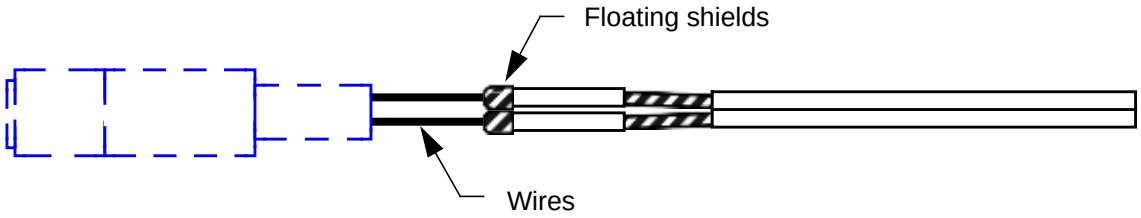
5.4.1 Terminate the overbraid shield at DMC-MD connectors as follows:

Step 1. Prepare the overbraid shield and convoluted tubing for termination according to section 5.2.

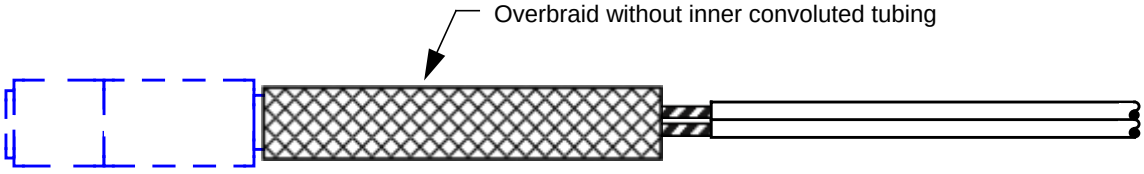
Step 2. Prepare the wire loom for installation of the GK 5385 shield support ring as specified in section 5.8.1. Remove 1" of the outer insulation at least 6" from the rear of the connector backshell.



Step 3. Terminate the individual wire shields with floating shields according to PPS 9.34.

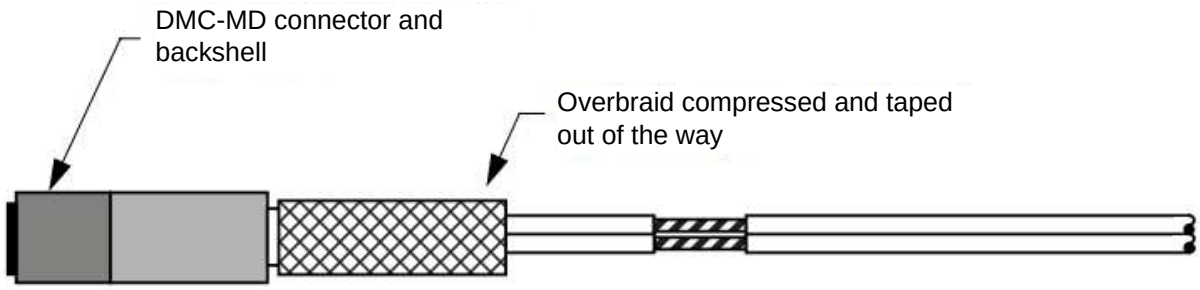


Step 4. Cut a length of overbraid (without inner convoluted tubing) to extend from the rear of the backshell to the mid-point of the stripped section of the individual wires and slip this length of overbraid onto the wire loom as shown:



Step 5. Install the DMC-MD connector as specified in PPS 9.22.

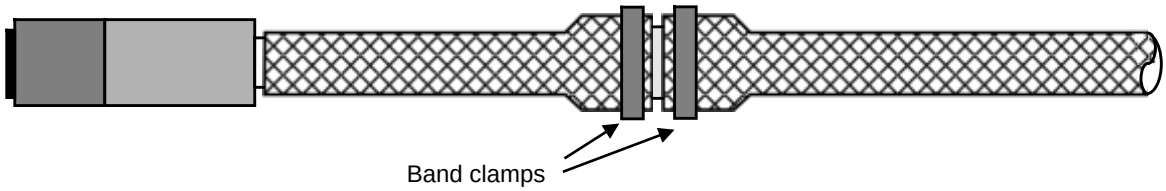
Step 6. Compress the overbraid and temporarily tape it out of the way as shown below:



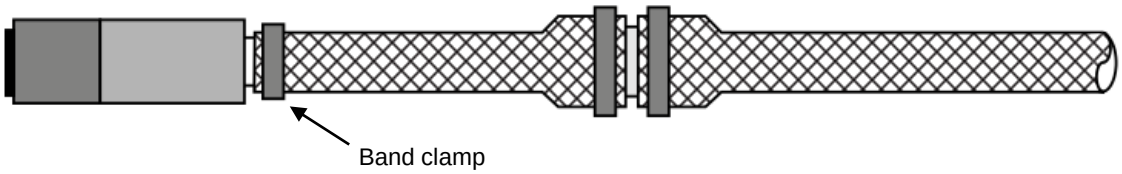
Step 7. Install a GK 5385 shield support ring around the exposed wire shields as specified in section 5.8.2.

Step 8. Terminate both lengths of overbraid at the support ring as specified in section 5.8.3.

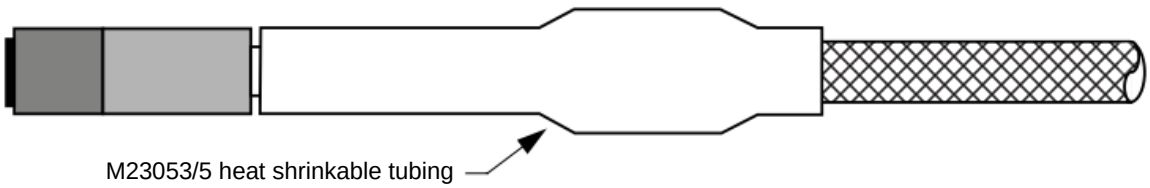
Step 9. Oversleeve the wire loom between the shield support ring and the connector backshell with the length overbraid prepared in Step 3 as shown below:



Step 10. Secure the length of overbraid between the connector and the ring to the backshell pipes with a band clamp according to section Step 5, as shown:



Step 11. Oversleeve the braid from the backshell pipes to approximately 1" beyond the shield support ring with heat shrinkable sleeving. Shrink the heat shrinkable sleeving in place according to PPS 10.16.

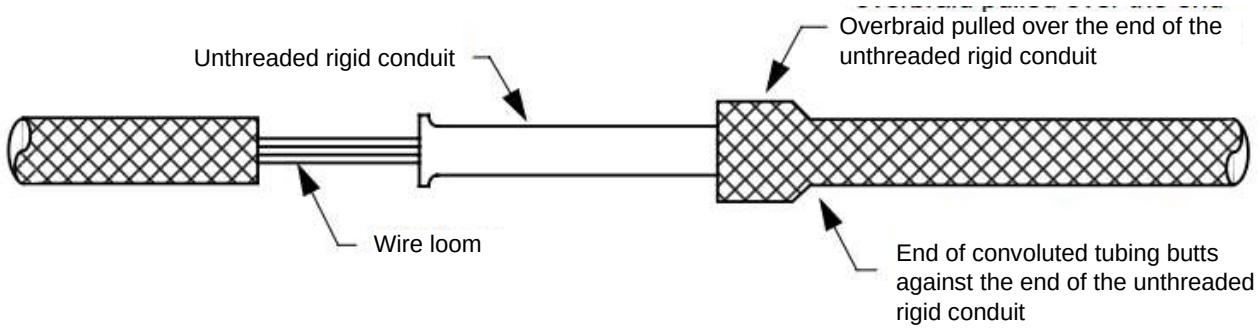


5.5 Termination of Overbraid Shields at Unthreaded Rigid Conduit

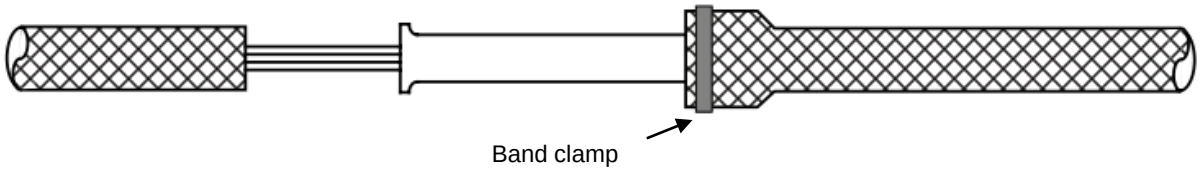
5.5.1 Terminate the overbraid shield at unthreaded rigid conduit as follows:

Step 1. Prepare the overbraid shield and inner convoluted tubing for termination according to section 5.2.

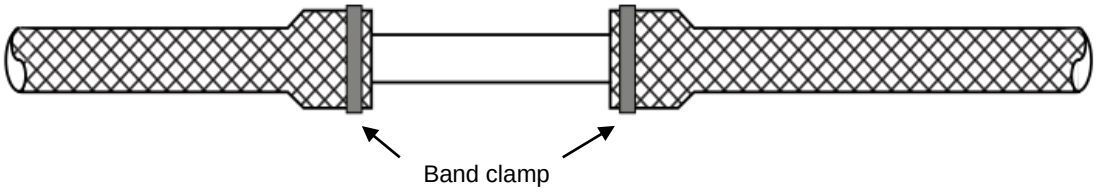
Step 2. Pull the overbraid shield and convoluted tubing up until the end of the convoluted tubing butts against the unthreaded rigid conduit and the overbraid extends over the unthreaded rigid conduit as shown:



Step 3. Secure the overbraid to the end of the unthreaded rigid conduit using a band clamp as shown:



Step 4. Repeat Step 1 through Step 3 for the other end of the unthreaded rigid conduit as shown:



5.6 Termination of Wire Harnesses at Connector Adaptors

5.6.1 General

5.6.1.1 There are several different types of connector adaptors at which overbraid shields, convoluted tubing and/or individual wire shields must be terminated. Refer to the appropriate following sub-section for the termination procedure:

Connector Adaptor	Section	Page
380-XXX	5.6.2	12
440-XXX	5.6.3	14
447-XXX	5.6.4	15
710-XXX	5.6.5	16

Connector Adaptor	Section	Page
6060 Series	5.6.6	18
6430 Series	5.6.6	18
3CGA Series	5.6.7	19

5.6.2 Termination of Overbraid Shields and Individual Wire Shields at 380-XXX Connector Adaptors

5.6.2.1 Terminate the overbraid shield and specified individual wire shields at 380-XXX connector adaptors as follows:

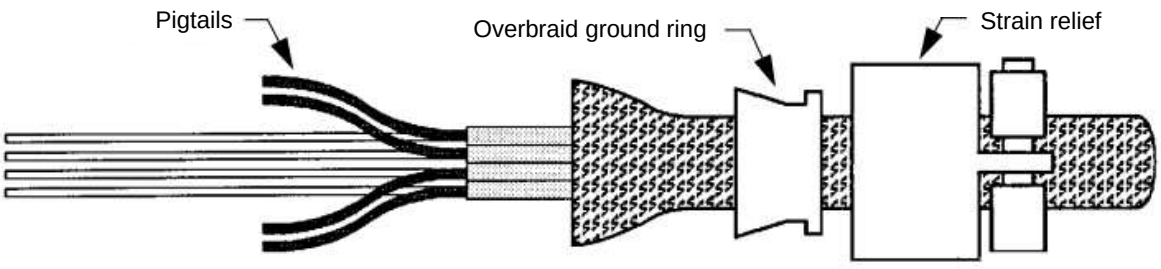
Step 1. Where the engineering drawing specifies termination of individual wire shields, use a hot tweezer stripping tool to strip back approximately 2" of the outer wire insulation to expose the individual wire shield.

Step 2. For each of the specified wires, form shield pigtails according to PPS 9.34.

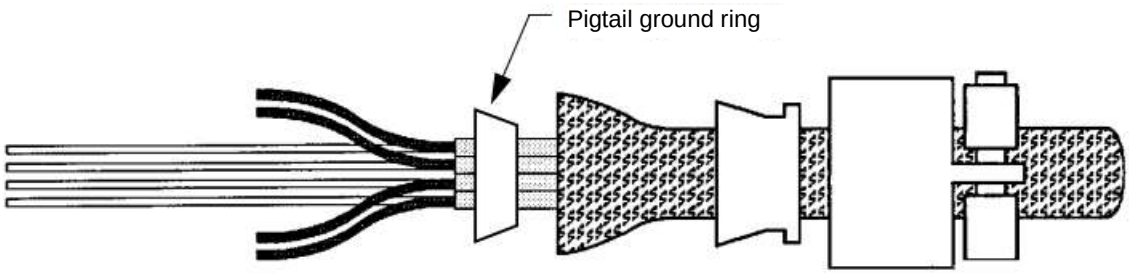
Step 3. Prepare the overbraid shield and inner convoluted tubing for termination according to section 5.2.

Step 4. Slip the prepared overbraid and inner convoluted tubing over the wire loom.

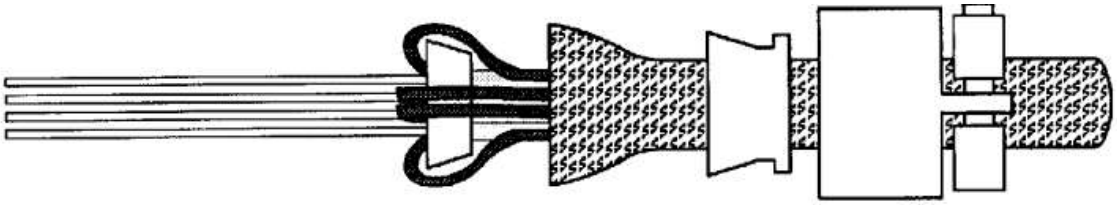
Step 5. Slip the strain relief and the overbraid ground ring over the overbraid shield as shown below:



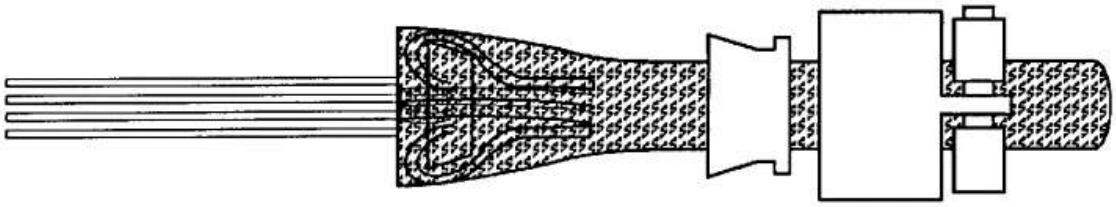
Step 6. Slip the pigtail ground ring over the wire loom as shown below:



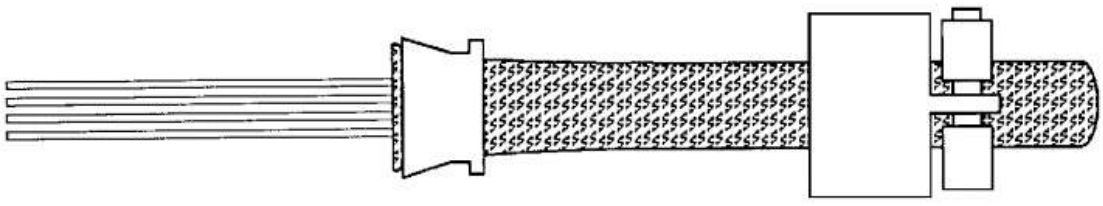
Step 7. Fold the pigtails back over the pigtail ground ring as shown below:



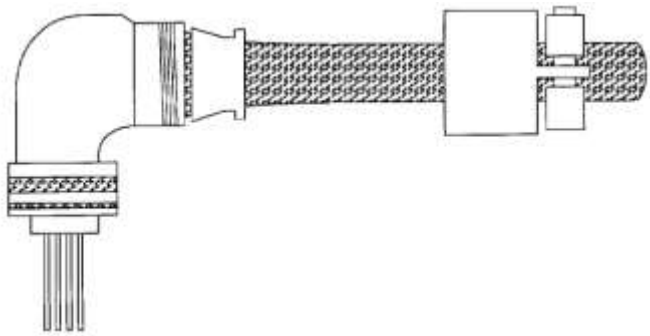
Step 8. Pull the overbraid up over the pigtails and pigtail ground ring as shown below:



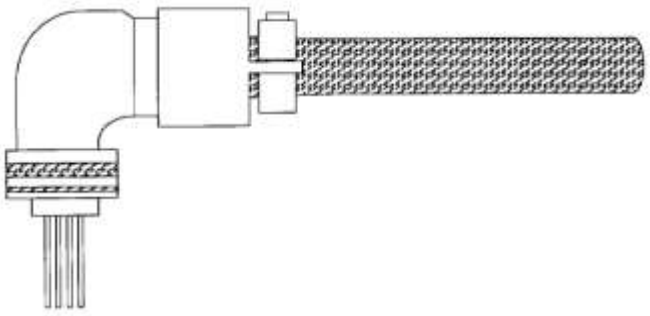
Step 9. Pull the overbraid ground ring up over the pigtails, pigtail ground ring and overbraid as shown below:



Step 10. Slip the body of the connector adaptor onto the wire loom as shown in the adjacent figure:



Step 11. Screw the strain relief ring onto the connector adaptor body as shown and tighten the strain relief clamp. Ensure that the inner convoluted tubing of the overbraid shield is secured under the strain relief clamp. If necessary to provide a snug fit of the strain relief clamp on the overbraid shield, wrap the overbraid in the area of the clamp with Knitmesh (ref. para. 4.1.3).



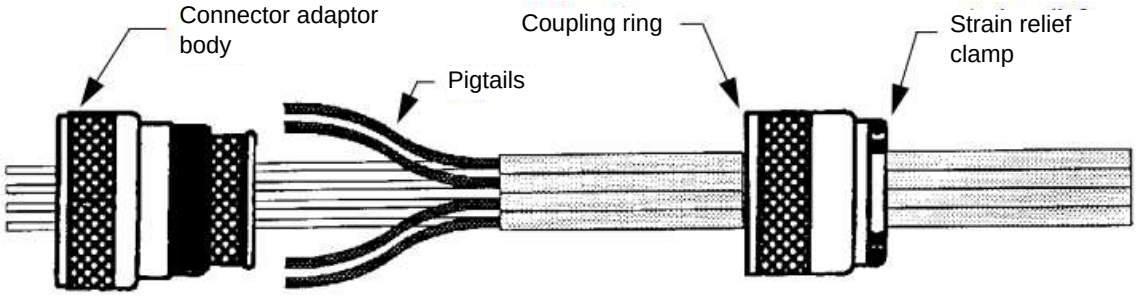
5.6.3 **Termination of Individual Wire Shields at 440-XXX Connector Adaptors**

5.6.3.1 Terminate the individual wire shields at 440-XXX connector adaptors as follows:

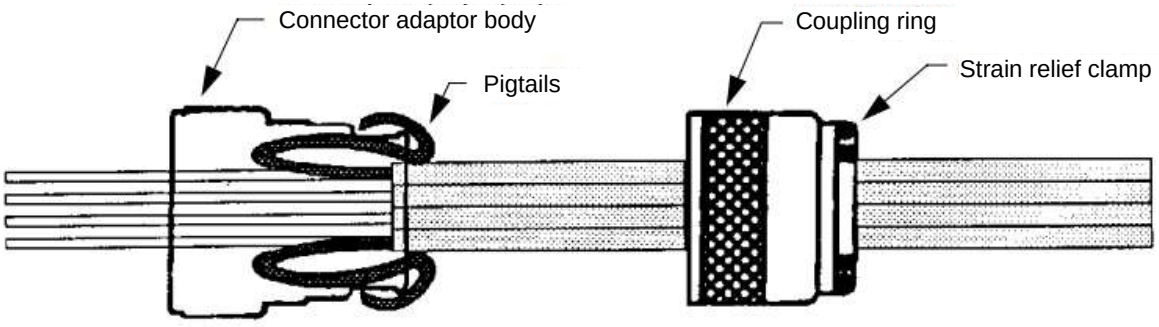
Step 1. Where the engineering drawing specifies termination of individual wire shields, use a hot tweezer stripping tool to strip back the outer wire insulation approximately 1.25" to expose the individual wire shields.

Step 2. For each of the specified wires, form shield pigtails according to PPS 9.34.

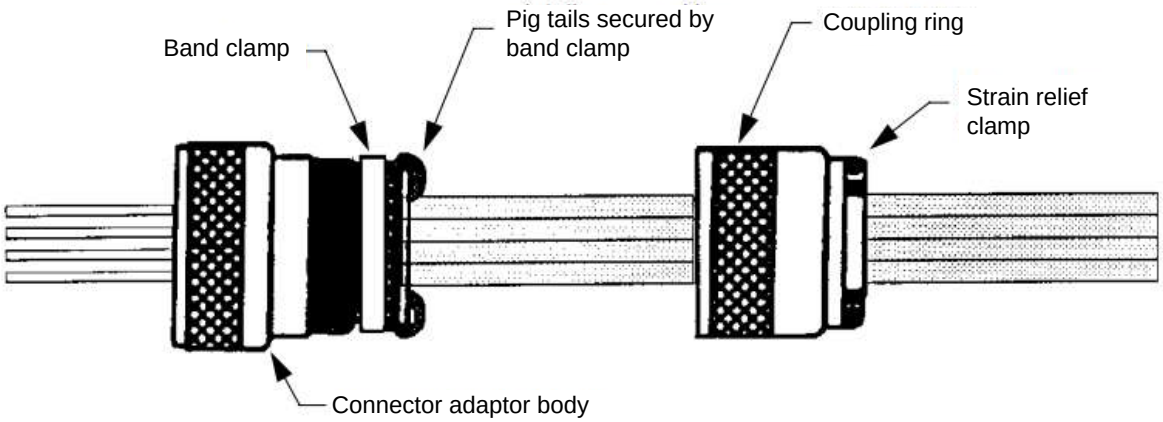
Step 3. Slip the connector adaptor body and coupling ring over the wire loom as shown below:



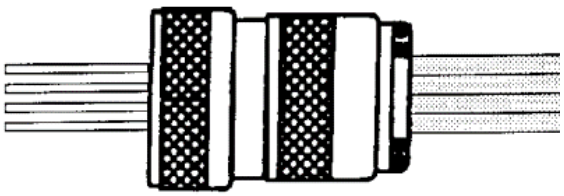
Step 4. Fold back the pigtails and fit them over the knurled area of the connector adaptor body as shown below:



Step 5. Secure the pigtails to the knurled area of the connector adaptor body with a band clamp as shown below:



Step 6. Assemble the coupling ring to the connector adaptor body and tighten the strain relief clamp to the wire loom as shown in the adjacent figure:



5.6.4 **Termination of Overbraid Shields at 447-XXX Connector Adaptors**

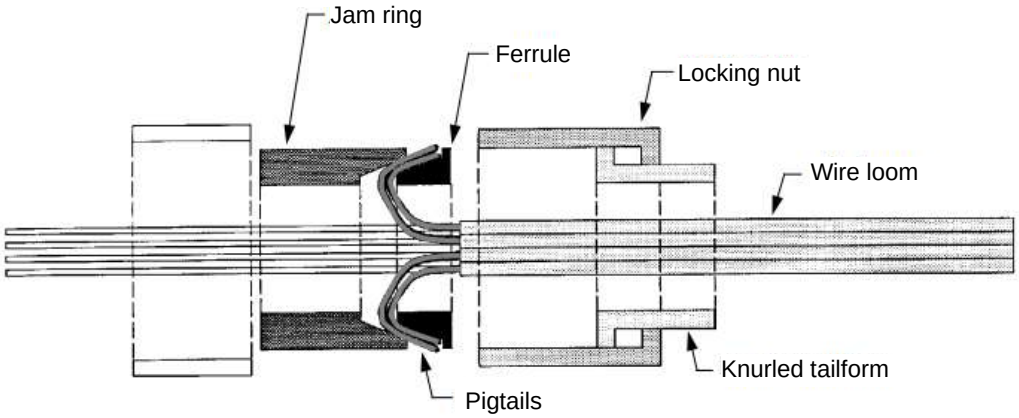
5.6.4.1 Terminate the overbraid shield and individual wire shields at 447-XXX connector adaptors as follows:

Step 1. Where the engineering drawing specifies termination of individual wire shields, use a hot tweezer stripping tool to strip back the outer wire insulation approximately 1.25" to expose the wire shield.

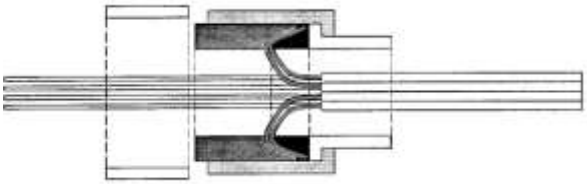
Step 2. For each of the specified wires of the wire loom, form shield pigtails according to PPS 9.34.

Step 3. Cut the overbraid shield to length using small scissors. Allow sufficient overbraid shield for assembly to terminating hardware.

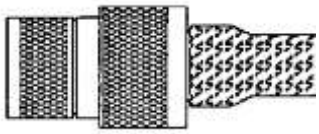
Step 4. Loosen the locking nut and pull it back to feed the wire braid pigtails between the ferrule and the jam ring as shown in the following cross-sectional view:



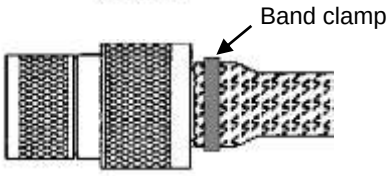
Step 5. Trim off excess length on the pigtails if necessary and tighten the locking nut to secure the pigtails between the ferrule and the jam ring as shown in the adjacent cross-sectional view:



Step 6. Pull the overbraid over the knurled portion of the tailform as shown in the adjacent figure:



Step 7. Secure the overbraid to the tailform using a band clamp according to section Step 5, as shown in the adjacent figure:



5.6.5 Termination of Overbraid Shields, Inner Convoluted Tubing and Individual Wire Shields at 710-XXX Connector Adaptors

5.6.5.1 Terminate the overbraid shield, inner convoluted tubing and individual wire shields at 710-XXX connector adaptors as follows:

Step 1. Where the engineering drawing specifies termination of individual wire shields, use a hot tweezer stripping tool to strip back the outer wire insulation approximately 1.25" to expose the wire shield.

Step 2. For each of the specified wires of the wire loom, form shield pigtails according to PPS 9.34.

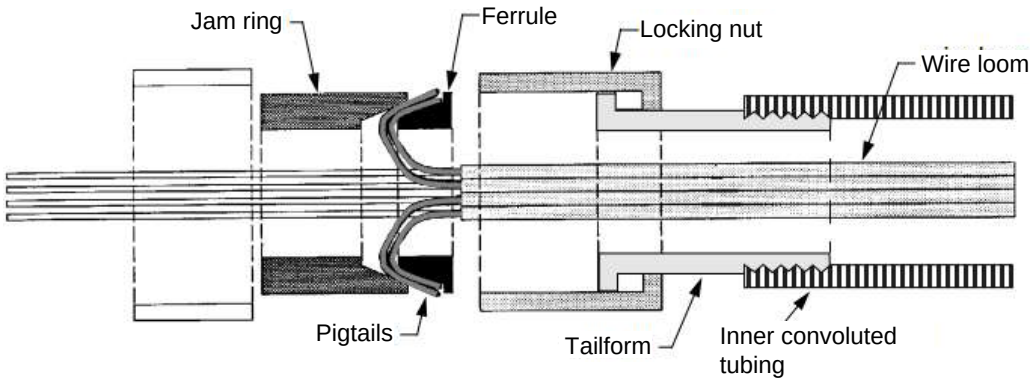
Step 3. Prepare the overbraid shield and inner convoluted tubing for termination according to section 5.2 and slip over wire loom.

Step 4. Pull back the braid to expose approximately 6" of the convoluted tubing. Use masking tape to hold it temporarily in place.

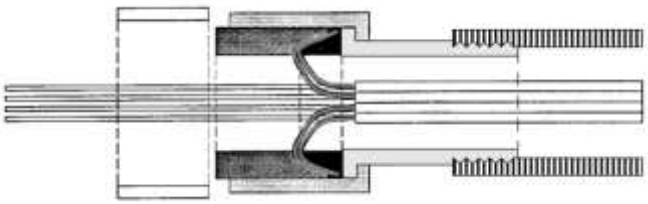
Step 5. Using the appropriate expansion tool (ref. Table 1), expand the inner convoluted tubing end enough to start threading in the adaptor.

Step 6. Screw the adaptor tailform into the inner convoluted tubing of the overbraid shield until the convoluted tubing covers the threaded tailform and meets the first shoulder of the connector.

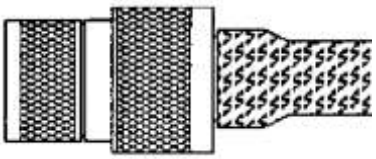
Step 7. Loosen the locking nut and pull it back to feed the wire braid pigtails between the ferrule and the jam ring as shown in the following cross-sectional view.



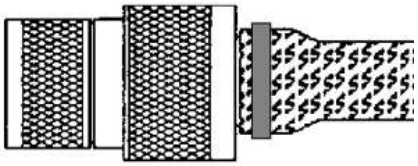
Step 8. Trim off excess length on the pigtails if necessary and tighten the locking nut to secure the pigtails between the ferrule and the jam ring as shown in the adjacent cross-sectional view:



Step 9. Pull the overbraid over the knurled portion of the tailform as shown in the adjacent figure:



Step 10. Secure the overbraid to the tailform using a band clamp as shown in the adjacent figure:

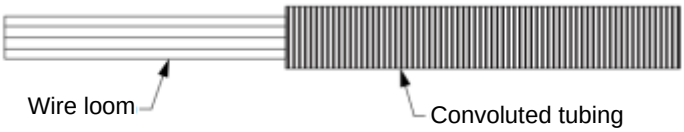


5.6.6 Termination of Convoluted Tubing at 6060 Series and 6430 Series Connector Adaptors

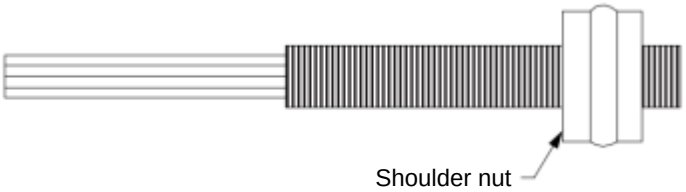
5.6.6.1 Terminate convoluted tubing at 6060 series and 6430 series connector adaptors as follows:

Step 1. Cut the convoluted tubing to length using a razor blade or sharp knife. Make the cut clean and at 90° to the axis of the tubing.

Step 2. Slip the convoluted tubing onto the wire loom as shown in the adjacent figure:

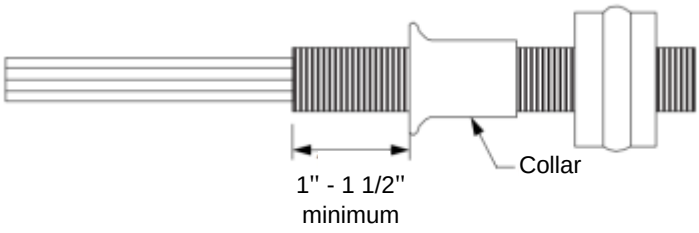


Step 3. Slide the shoulder nut over the convoluted tubing as shown in the adjacent figure:

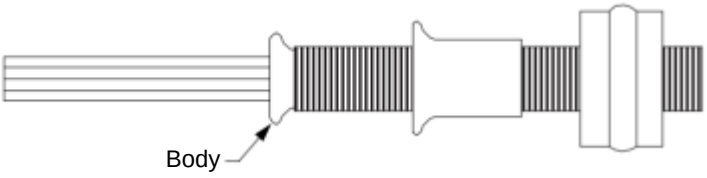


Step 4. Screw the collar onto the outside of the convoluted tubing as shown in the adjacent figure:

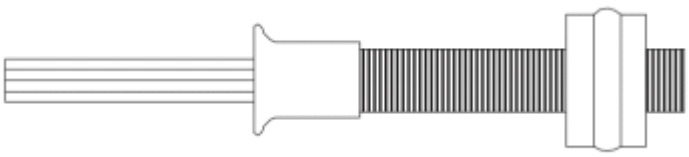
Step 5. Using the appropriate expansion tool (ref. Table 1), expand the end of the convoluted tubing using the appropriate expansion tool.



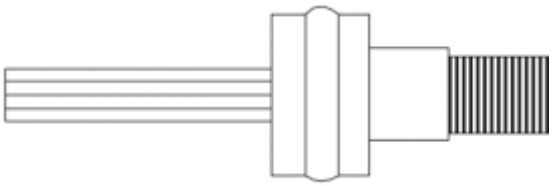
Step 6. Screw the body of the connector adaptor into the convoluted tubing until the tubing covers the threaded tailform and contacts the cone section as shown in the adjacent figure.



Step 7. Screw the collar over the body as shown in the adjacent figure:



Step 8. Slide the shoulder nut over the assembled body/collar as shown in the adjacent figure:

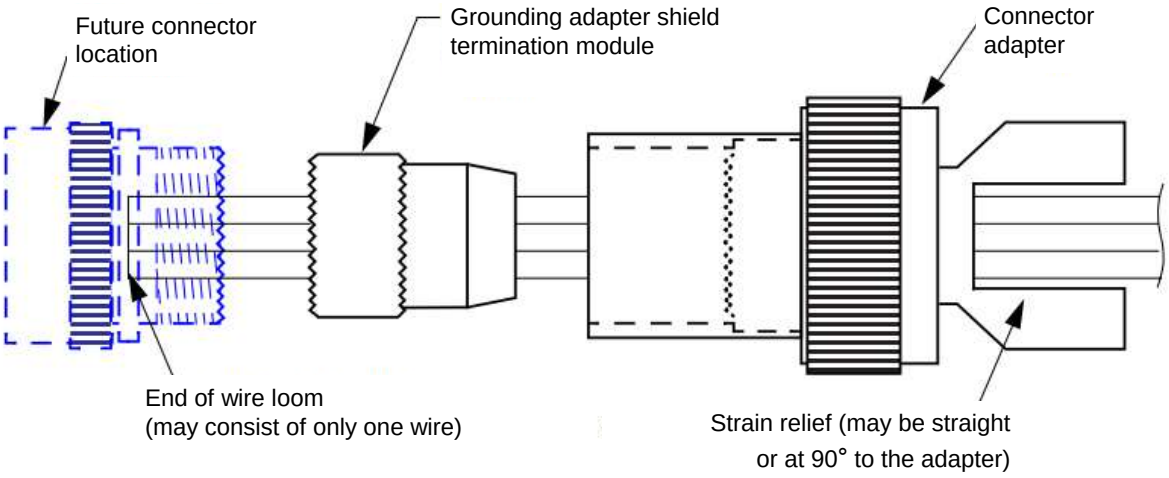


Step 9. If the connector adaptor includes a reduction nut, screw the reduction nut into the shoulder nut.

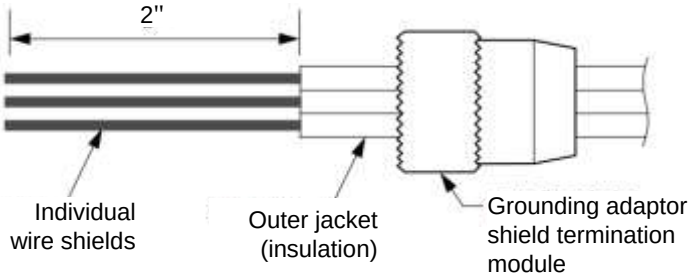
5.6.7 Termination of Individual Wire Shields at 3CGA Connector Adaptors

5.6.7.1 Terminate individual wire shields at 3CGA connector adaptors as follows:

Step 1. Slide the grounding adaptor shield termination module and the connector adaptor onto the wire loom as shown in the following figure. The strain relief on the connector adaptor may be either straight or at 90° to the adaptor.



Step 2. Taking care not to mark or nick the exposed shields, strip approximately 2" of the outer jacket from each of the wires in the wire loom as specified in PPS 9.34. The jacket should extend beneath the adaptor when the adaptor is in its final position. Make sure that the exposed shields are free of insulation.



Step 3. Form shield pigtails for each of the wires in the wire loom as specified in section 5.7.

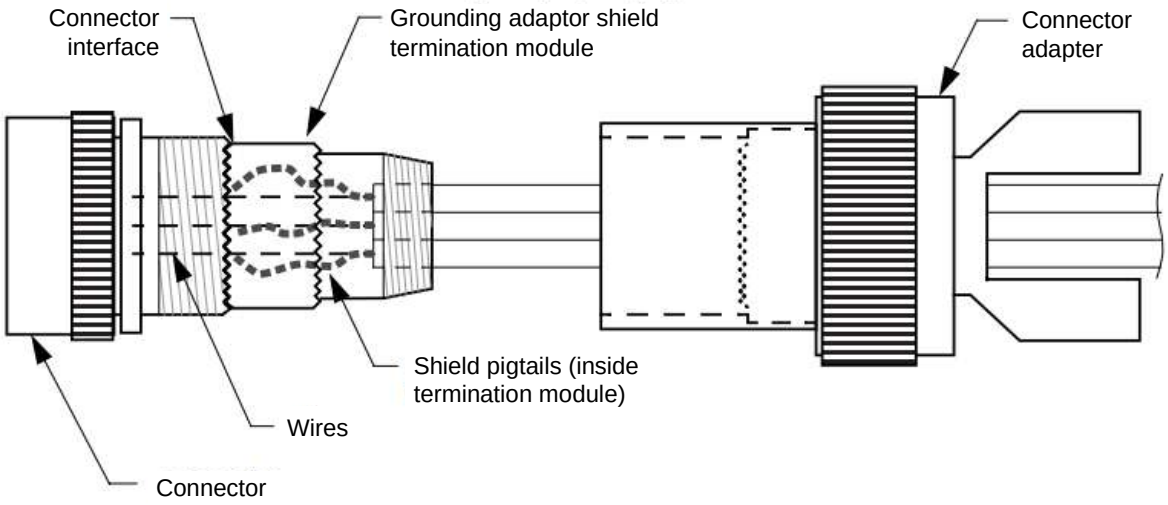
Step 4. For each of the wires in the wire loom, flatten the shield pigtail and gently twist the end to prevent any shield strands from unraveling. Ensure that the shield remains braided

along its entire length. If the shield unravels, the overall diameter of the termination area is reduced and the performance of the termination is degraded.

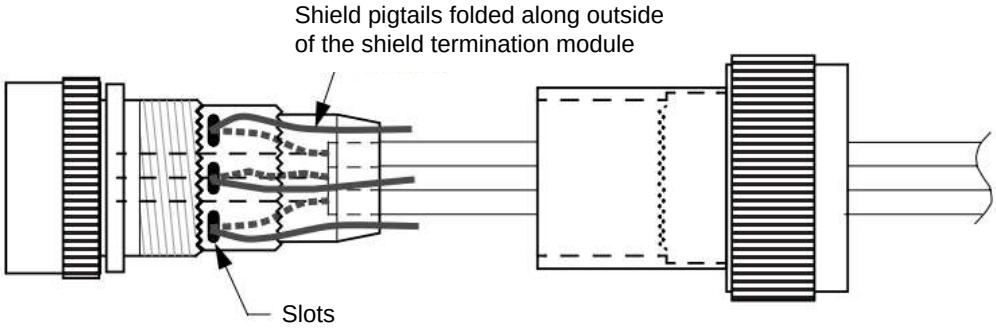
Step 5. Terminate each individual wire with crimp contacts according to PPS 9.19 (Automatic Crimping of Size 16 - 22 Electrical Contacts) or PPS 9.36 (Manual Crimping of Size 12 - 22 Contacts).

Step 6. Assemble the contacts to the connector according to PPS 9.22.

Step 7. Slide the shield termination module over the shield pigtails so that its teeth mesh with the teeth of the connector as shown in the following figure. A small piece of tape may be used at the connector interface to temporarily hold the shield termination module in place, but it must be removed before final assembly.

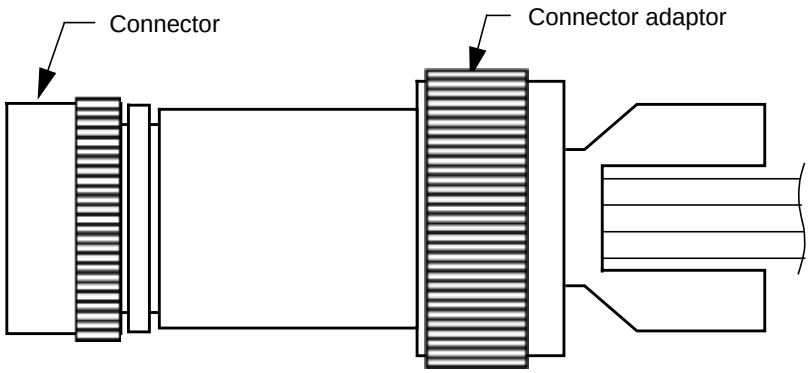


Step 8. Pull the shield pigtails through the slots in the shield termination module and fold them along the outside of the shield termination module as shown in the following figure. Evenly distribute the shields around the termination module and ensure that they remain flat.



Step 9. Remove any tape which is being used to hold the shield termination module in place.

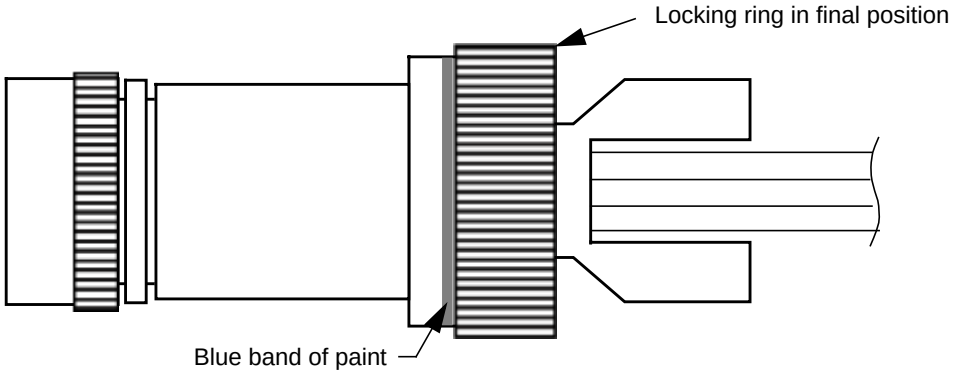
Step 10. Slide the connector adaptor over the shield termination module as shown below:



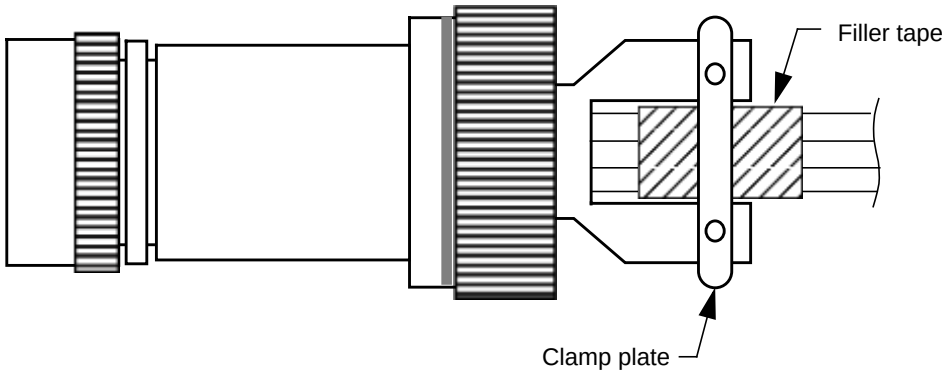
Step 11. Secure the adaptor to the connector. Hold the connector in place and use a strap wrench, complete with a torque wrench as specified in para. 4.2.2, to apply a torque of 30 in-lbs ± 5 in-lbs to the adaptor. Ensure that neither the connector nor the adaptor is deformed during the installation process and that the anti-rotation teeth are locked together. If a heat shrinkable boot is going to seal the connector or if it is necessary to prevent loosening of the adaptor during handling, assemble the adaptor onto the connector with Grade M anaerobic sealant according to PPS 19.02. The following is a list of suggested methods of holding the connector in place:

- Use a pair of soft jawed pliers.
- Use another strap wrench.
- Secure the mate of the connector to a stationary object such as a board and hold the connector in place by inserting it into its stationary mate.

Step 12. Slide back the locking ring on the adaptor to expose the blue coloured indicator on the coupling nut (the red coloured indicator will no longer be visible). If the teeth of the locking ring do not line up with the teeth of the adaptor, slightly tighten the adaptor until the locking ring can be slid into place. Do not loosen the adaptor.



Step 13. Complete the installation of the strain relief clamp by screwing on the two clamp plates. If necessary, wrap the wire loom with filler tape (ref. para. 4.1.5) to ensure that the clamp has a secure grip on the wires.



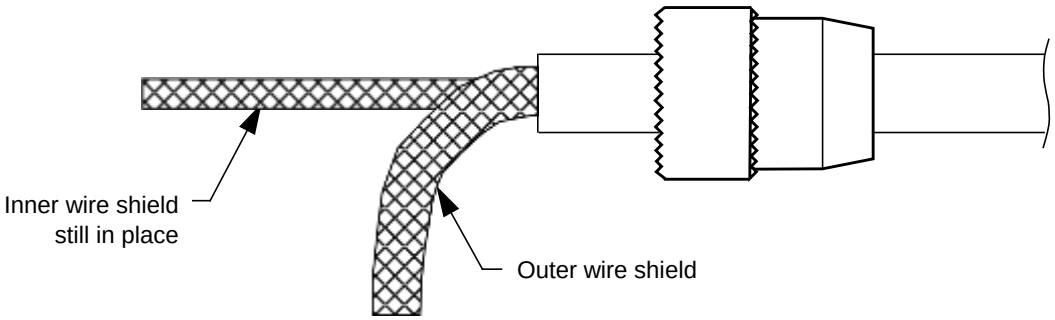
5.6.7.2 If it is necessary to disassemble the individual shield termination, carefully thread the shield pigtails through the shield termination module as the shield termination module is pulled back. Ensure that the pigtails are not ripped or damaged in the process.

5.7 Formation of Shield Pigtails

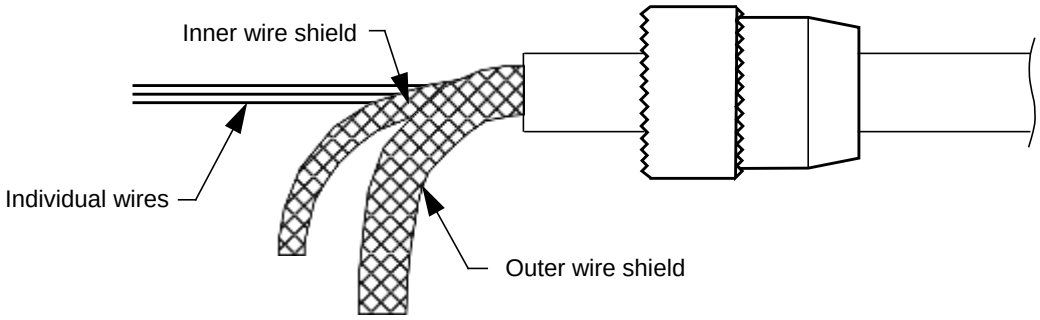
5.7.1 If a wire has a single individual wire shield, form the shield pigtail as specified in PPS 9.34.

5.7.2 If a wire has a double (i.e., inner and outer) individual wire shield, form the shield pigtail as follows:

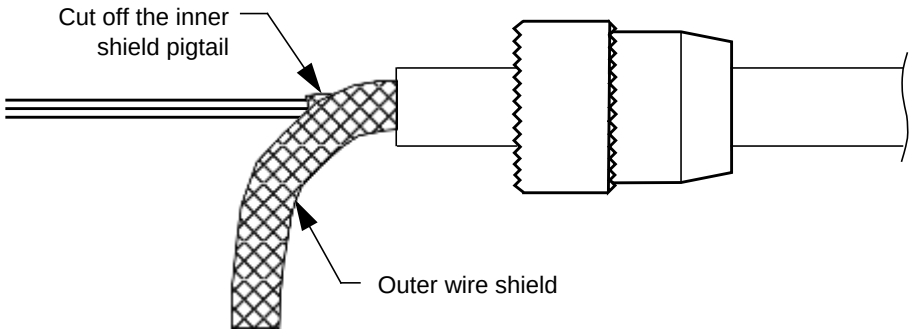
Step 1. Form a shield pigtail consisting of the outer individual wire shield according to PPS 9.34 as shown below.



Step 2. Form a shield pigtail consisting of the inner individual wire shield according to PPS 9.34.



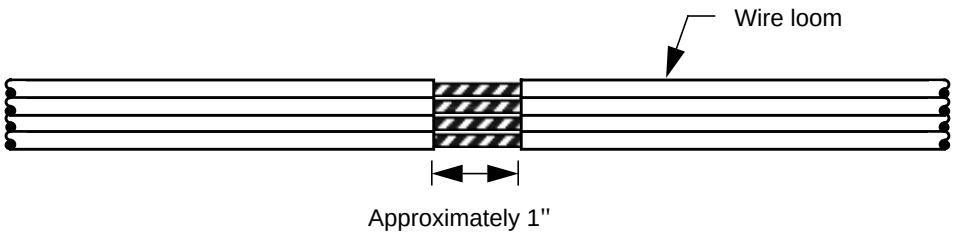
Step 3. Cut off the inner shield pigtail and discard the removed length of shield. It is acceptable to ground only the outer wire shield.



5.8 Installation of GK 5385 Shield Support Ring

5.8.1 Preparation of Wire Loom

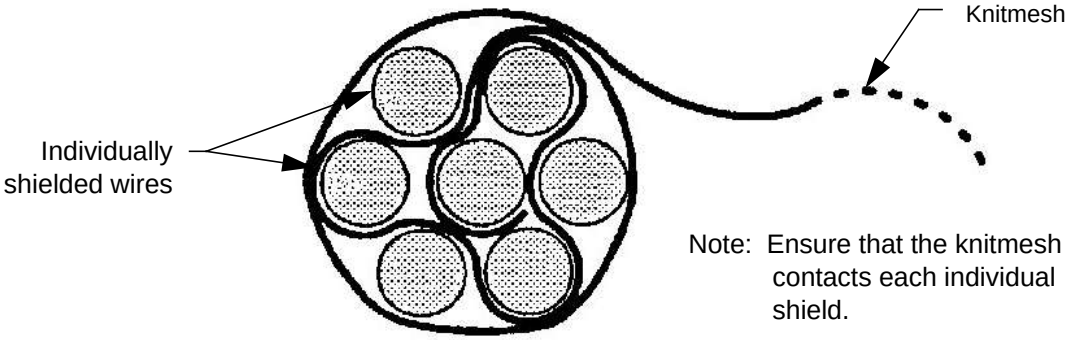
5.8.1.1 For each of the wires specified by the engineering drawing, use a hot tweezer wire stripping tool to remove a 1" section of the outer insulation and expose the shield. Take care not to damage the shield when removing the outer layer of insulation.



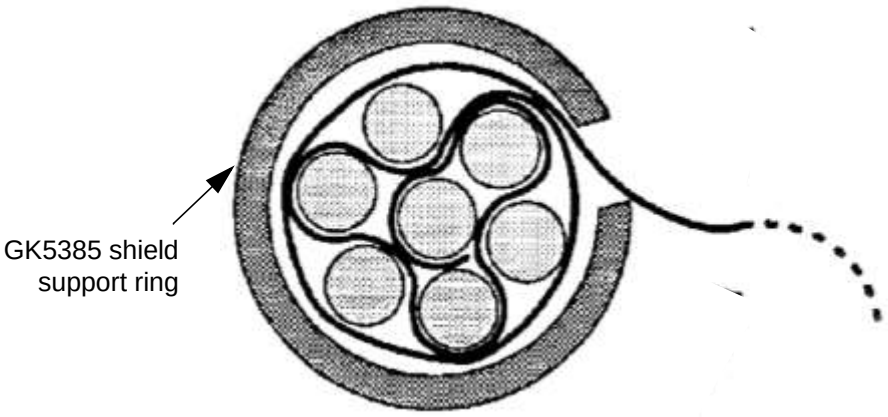
5.8.2 **Installation of Ring**

5.8.2.1 Install the GK 5385 support ring around exposed wire shields as follows:

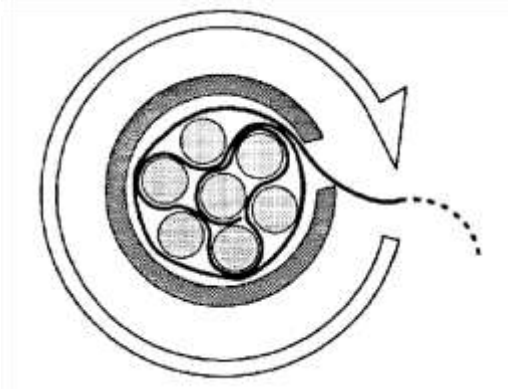
Step 1. Wrap a length of knitmesh (ref. para. 4.1.3) around and through the exposed shields of the wire loom as shown in the following cross-sectional view:



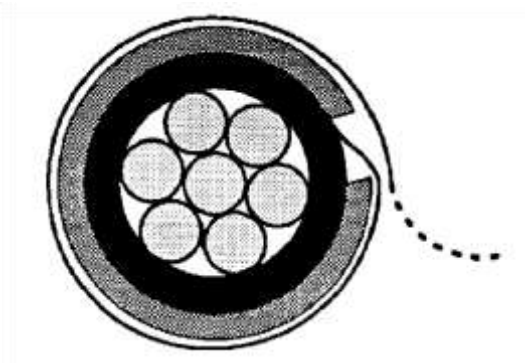
Step 2. Position a GK 5385 shield support ring over the exposed shields and feed the end of the braid through the slot in the ring as shown:



Step 3. Twist the shield support ring in the same direction as the knitmesh was wrapped around the wire shields while feeding in the tail of the knitmesh until the shield support ring is packed and cannot rotate any further.



Step 4. Wrap the knitmesh around the outside of the shield support ring as shown below:



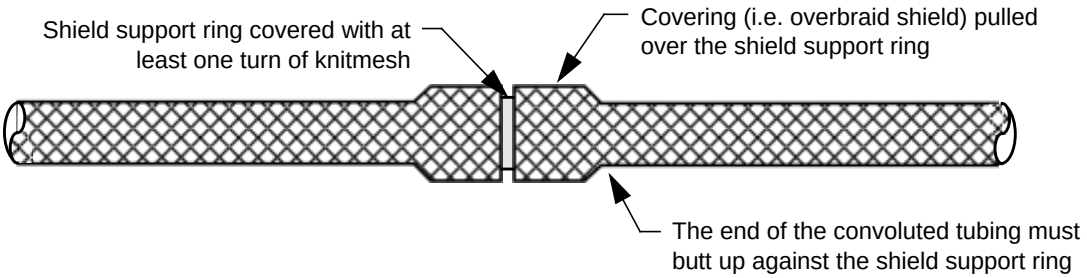
Step 5. Trim off the knitmesh after at least one full turn.

Step 6. To ease termination of wire loom coverings such as overbraid shields and DSC 300 sleeving at the GK 5385 support ring, it is recommended to secure the knitmesh to the shield support ring using a nylon lacing tape tie (ref. para. 4.1.4). Ensure that the knitmesh is tightly wrapped around the shield support ring when securing it.

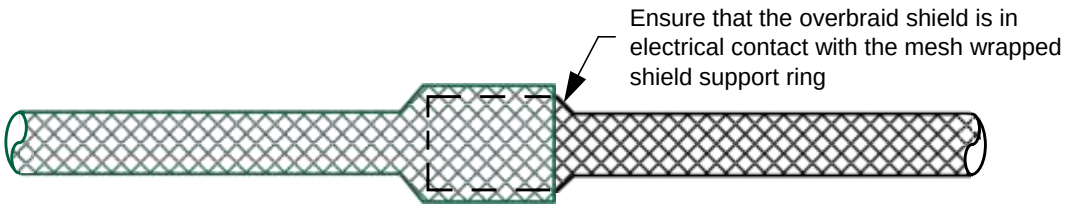
5.8.3 Termination of Wire Loom Coverings at Ring

5.8.3.1 Terminate wire loom coverings such as overbraid shields and DSC 300 sleeving at the GK 5385 support ring as follows:

Step 1. Pull the coverings up so that they extend over the knitmesh wrapped shield support ring. Ensure that the knitmesh is wrapped tightly around the support ring when overlapped with the coverings. If convoluted tubing is present, pull it up until the end of the tubing butts up against the shield support ring. The coverings may terminate side by side or may overlap one another as shown in the following figure. If the coverings overlap and only one is an overbraid shield, make sure that the overbraid shield is beneath the other (non-conductive) covering and is in full contact with the knitmesh wrapped shield support ring.

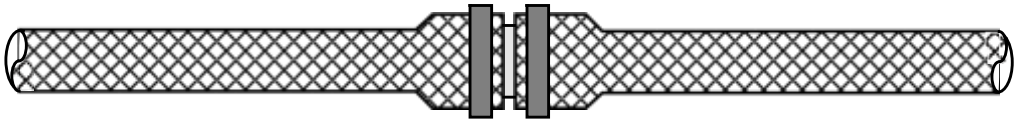


Side by Side Termination of Coverings

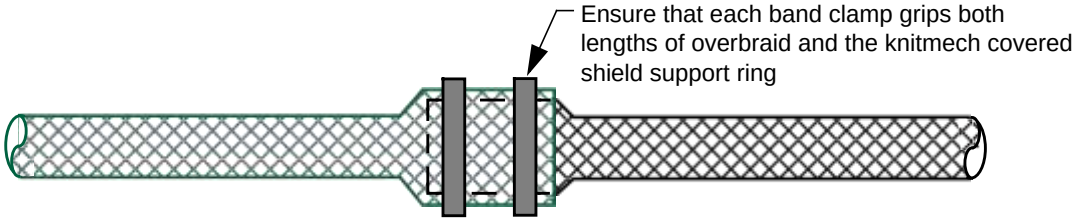


Overlapping Termination of Overbraid

Step 2. Use band clamps to secure the wire loom coverings to the shield support ring as shown in the following figure. If the coverings terminate side by side, install a separate band clamp at the end of each covering. If the coverings overlap, install two band clamps so that each of the clamps grips both of the coverings and the shield support ring.



Side by Side Termination of Overbraid



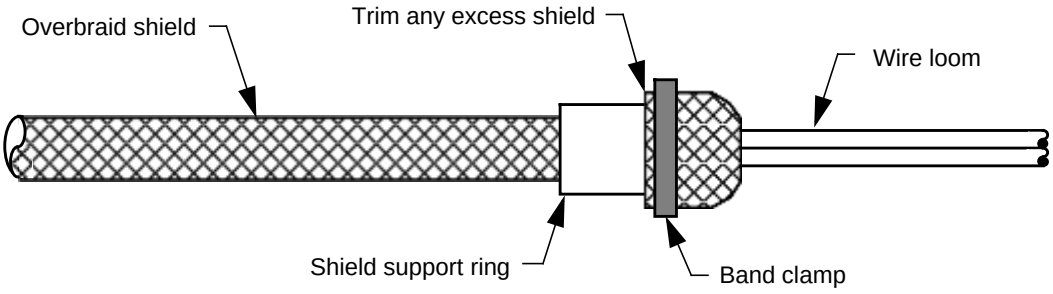
Overlapping Termination of Overbraid

5.9 Floating Termination of Overbraid Shields in Mid-Loom

5.9.1 If specified by the engineering drawing, use a GK 5385 shield support ring to terminate overbraid shields in mid-loom as follows:

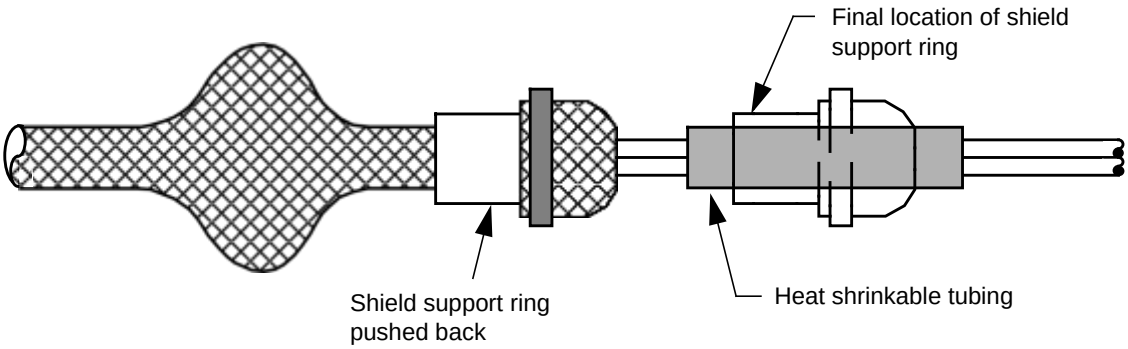
Step 1. Slide the shield support ring over the overbraid shield.

Step 2. Flip the end of the overbraid shield over the support ring as shown in the following figure and hold it in place with a band clamp.

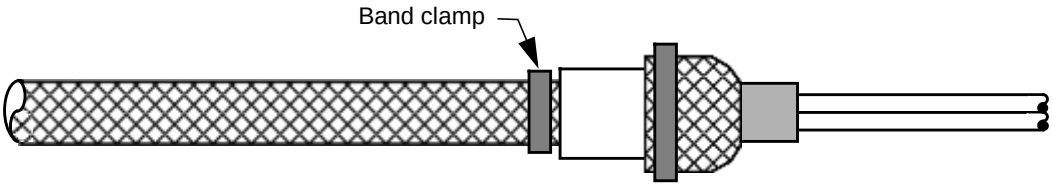


Step 3. Use a razor knife, a pair of small, sharp scissors, or flush cutters to trim any excess overbraid shield.

Step 4. Push back the overbraid shield and install a length of heat shrinkable sleeving over the wire loom beneath the final location of the shield termination ring. This will prevent the ring from chafing the wires beneath.



Step 5. Slide the shield support ring into its final position and install a band clamp around the overbraid shield, near the shield support ring, to hold the ring in place.



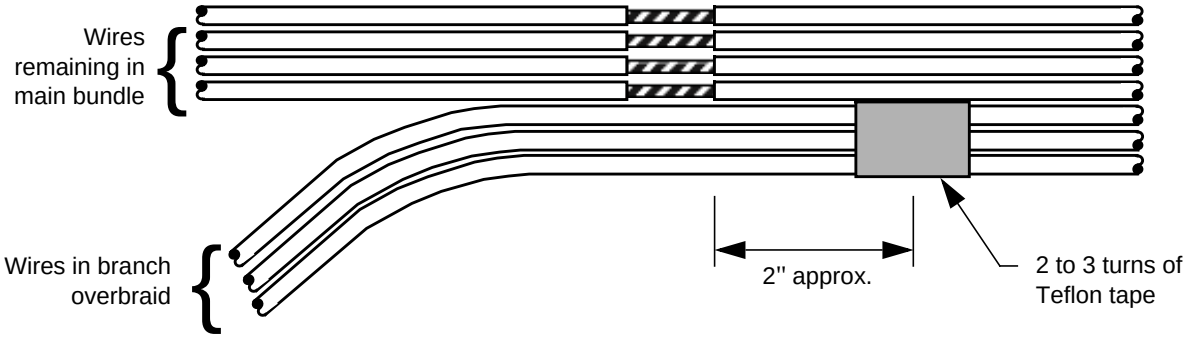
5.10 Installation of Overbraid Penetrating Overbraid Near a GK 5385 Shield Support Ring

5.10.1 Form overbraid breakouts which do not occur adjacent to a GK 5385 shield support ring as specified in PPS 9.31.

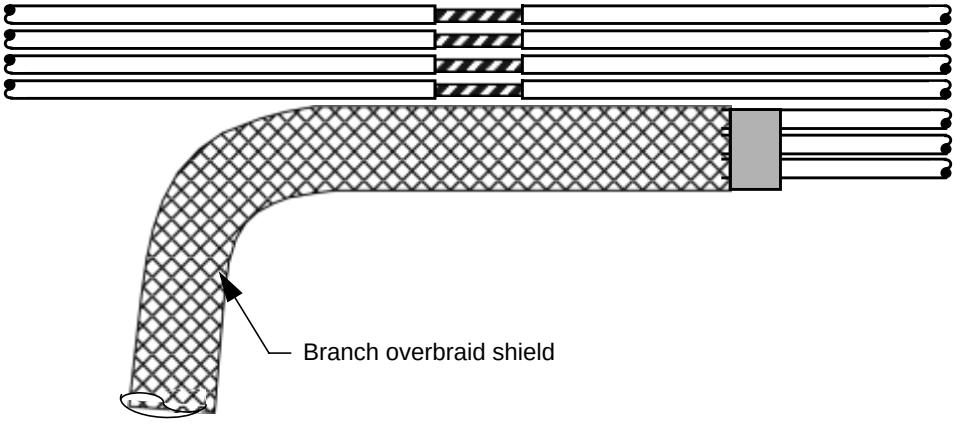
5.10.2 If the engineering drawing specifies an overbraid breakout adjacent to a GK 3585 shield support ring, install the branch and main harness overbraid as follows:

Step 1. Prepare the wire loom for installation of the GK 5385 shield support ring as specified in section 5.8.1.

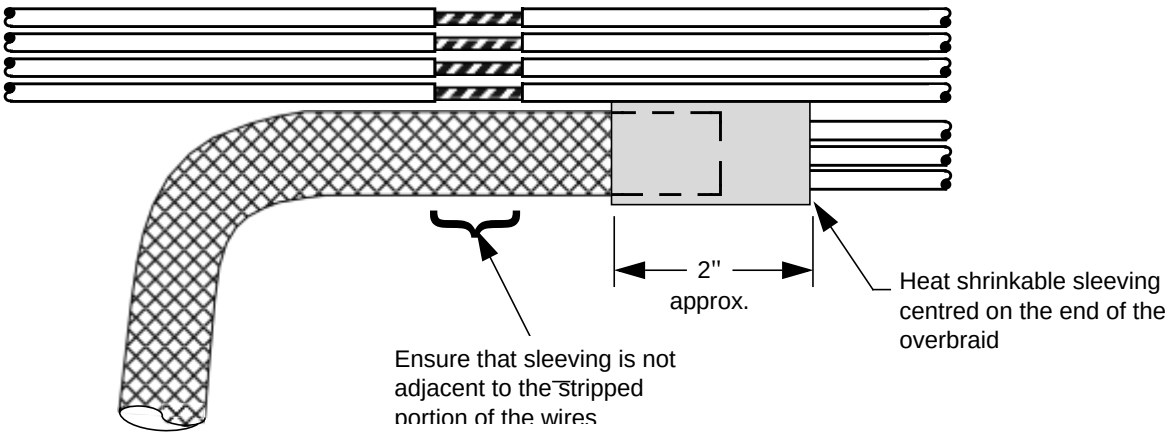
Step 2. Prepare the branching bundle of wires for installation of the branch overbraid by wrapping 2 to 3 turns of Teflon tape around the bundle approximately 2" before the stripped portion of the main bundle wires.



Step 3. Slip the required length of overbraid shield onto the branching bundle so that the end of the overbraid is approximately centered over the Teflon tape. When determining the required length of overbraid shield, keep in mind that the shield may have to cover contacts connecting this breakout to another one as outlined in section 5.11.



Step 4. Centre a 2" length of heat shrinkable sleeving over the end of the overbraid and shrink it in place according to PPS 10.16. Ensure that the sleeving is not adjacent to the stripped portion of the main bundle wires.

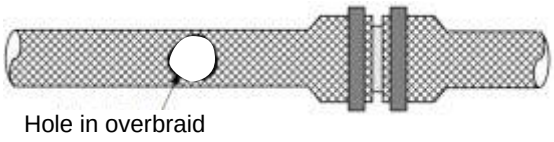


Step 5. Install the GK 5385 shield support ring as specified in section 5.8.2. Treat the overbraided branching bundle as if it were one of the stripped wires (i.e. wrap it with knitmesh too).

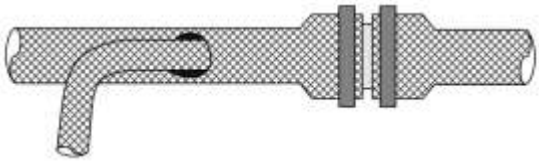
Step 6. Slide the main bundle overbraid over the entire bundle, including the breakout branch.

Step 7. Terminate the main bundle overbraid at the shield support ring as specified in section 5.8.3.

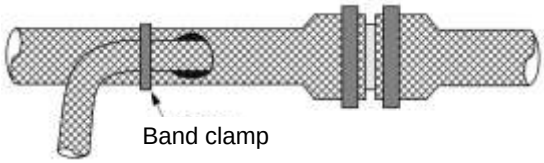
Step 8. Use a suitable probe (i.e. pen or marker) to slowly separate the weave of the main harness overbraid until a large enough hole is created to accommodate the breakout bundle.



Step 9. Pull the overbraided breakout bundle through the hole in the main branch overbraid. Route separate breakout branches through separate holes. Do not route multiple breakouts through the some hole.

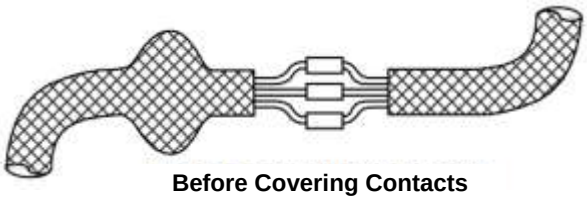


Step 10. Secure the breakout bundle to the main bundle by installing a band clamp around both bundles.

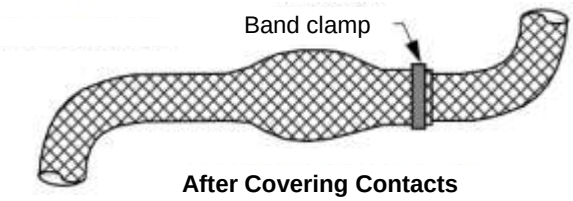


5.11 Covering Contacts which Connect Branch Breakouts with Overbraid Shield

5.11.1 If the engineering drawing specifies covering contacts which connect branch breakouts with overbraid shield, the overbraid shield of one of the branch breakouts should be long enough to extend over the contacts. Pull this shield over the contacts so that it overlaps the shield of the other branch breakout and secure the overbraid shields in position with a band clamp as shown in the adjacent figure.



Before Covering Contacts



After Covering Contacts

5.12 Drainage Hole Installation

5.12.1 If specified by the engineering drawing, create drainage holes at the lowest points of the cable assembly as follows:

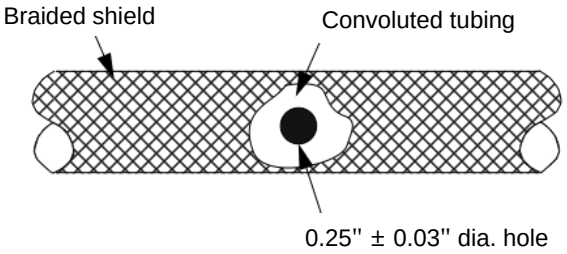
Step 1. Use a blunt scribing tool to spread the braided shield apart without damaging it.

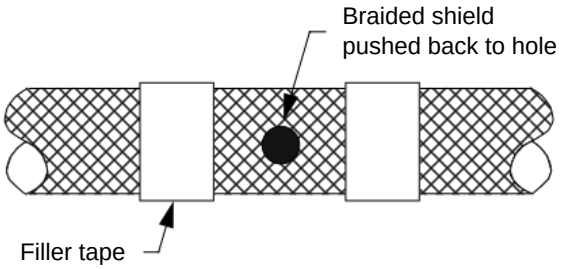
Step 2. Use diagonal cutters to cut a hole with a diameter of 0.25" ± 0.03" in the convoluted tubing, taking care not to damage the wires.

Step 3. Push the braided shield back over the convolution.

Step 4. Use filler tape (ref. para. 4.1.5) to tape over the braided shield on each side of the hole.

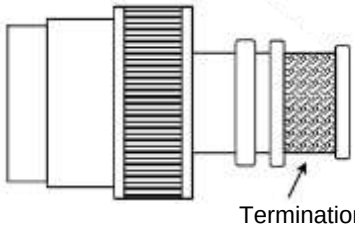
Step 5. Mark the new part number on the assembly according to PPS 15.01.





5.13 Installation of Band Clamps

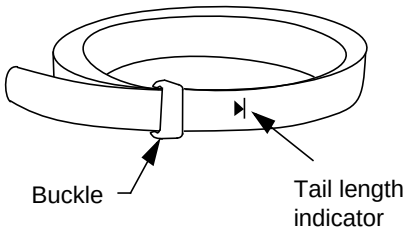
5.13.1 When installing band clamps at adapters and backshells ensure that the installed band clamp will be centred on the termination land.



5.13.2 Install band clamps as follows:

Step 1. When securing overbraid, “milk” the overbraid (i.e., grip and run hands along the braid) to remove slack and insure a snug fit before installing band clamps.

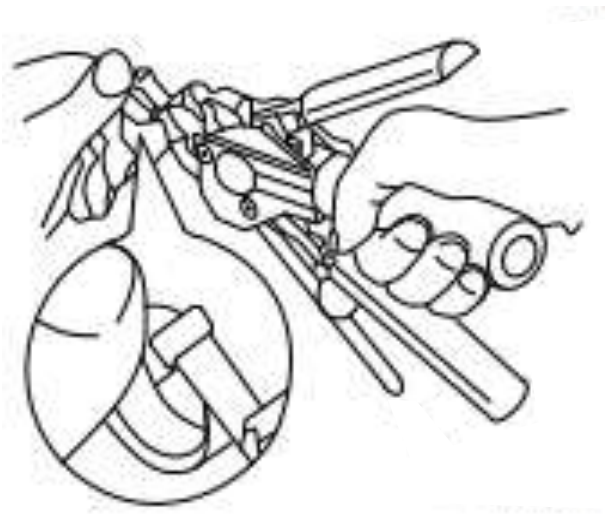
Step 2. Roll the band of the band clamp over the assembly and through the buckle slot twice as shown in the adjacent figure.



Step 3. Pull on the band until the tail length indicator is within at least 0.25" of the buckle slot. It is acceptable to tighten the band further if desirable.

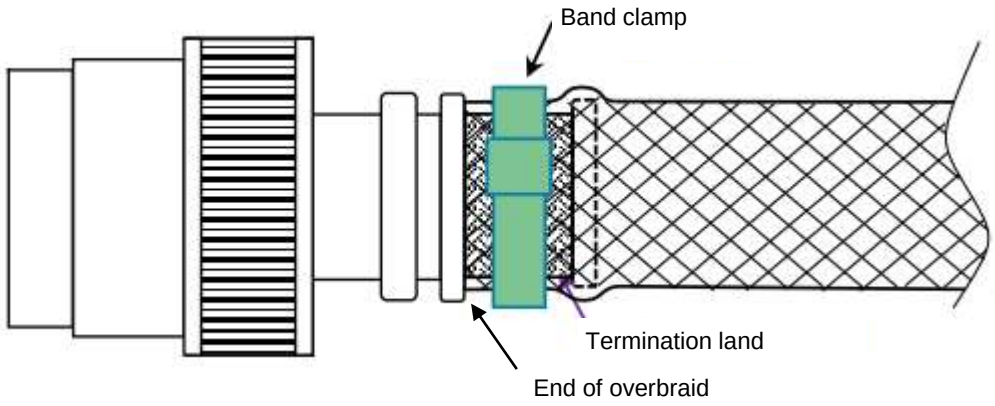
Step 4. Squeeze the gripper release lever of the band installation tool (ref. para. 4.2.7) and insert the band into the front opening of the tool with the circular portion of the band facing downward.

Step 5. Align the band and tool with the overbraid termination area (e.g., termination land) and squeeze the pull-up handle repeatedly until it locks against the tool body. This indicates that the band has been tightened to the tool pre-calibration tension.



Step 6. Complete the band clamp installation by squeezing the cut-off handle.

Step 7. Remove the trimmed off excess band from the tool.



6 Requirements

6.1 Overbraid shields, convoluted tubing and/or individual wire shields shall be terminated as specified in herein, as applicable.

7 Safety Precautions

7.1 **The safety precautions specified herein are specific to Bombardier Toronto (de Havilland) to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.**

7.2 **Observe general shop safety precautions when performing the procedure specified herein.**

8 Personnel Requirements

8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.