DE HAVILLAND AIRCRAFT OF CANADA LIMITED

PPS 9.39

PRODUCTION PROCESS STANDARD

PROPRIETARY INFORMATION

INSTALLATION & TERMINATION OF BRAIDED SHIELDS FOR EMI & HIRF PROTECTION OF WIRE HARNESSES ON DASH 8 SERIES 400 AIRCRAFT

Issue 27
- This standard supersedes PPS 9.39, Issue 26.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@dehavilland.com.
- This PPS is effective as of the distribution date.

- **THIS STANDARD SPECIFIES MANUFACTURING PROCESSES WHICH ARE CRITICAL TO THE LIGHTNING PROTECTION AND TRANSPORT CANADA CERTIFICATION OF DHC 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, DAD 212) November 30, 2021

Lightning/EMI/HIRF

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PPS Group

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M&P Engineering

Signed original on file. Validation of paper prints is the responsibility of the user.

Issue 27 - 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 sections of this PPS for detailed procedure and requirements.

- Replaced throughout PPS where “Bombardier” is specified with “De Havilland Aircraft of Canada Limited” or “DHC”.
- Revised Facilities Requirements section.
- Deleted Page Number from Table I. Just specified the referencing paragraph or PPS.
- Specified to apply MIL-A-46146 sealant (ref. paragraph 4.1.8) to the first few threads of the convoluted tubing prior to installing into the adaptor (see paragraph 5.5.2).
- Split previous issue section “Installation of Solder Sleeve” to two separate sections (i.e., Placement of Solder Sleeves and Installation of Solder Sleeves) as 3CGA, 3CFUGA and OL Series adaptors placement requirements have been revised. See section 5.7. Specified limitations and exceptions for connectors mounted on Q400 Critical Equipment as listed in new Table VI.
- When installing solder sleeves, specified to not move the wire during the heating process as this may cause a cold solder joint. See paragraph 5.8.1.

TABLE OF CONTENTS

Sections **Page**

Tables

Figures

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for installing/terminating braided shields for EMI and HIRF protection of wire harnesses on DASH 8 series 400 aircraft.

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.

2 HAZARDOUS MATERIALS

2.1 Before receipt at De Havilland Aircraft of Canada Limited (DHC), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the DHC 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 DHC Environment, Health and Safety Department.

3 REFERENCES

3.1 PPS 9.01 - Crimping Electrical Terminal Lugs to Copper Wire.

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

3.3 PPS 9.06 - Electrical Bonding and Grounding of Aircraft Structures.

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

3.5 PPS 9.22 - Assembly of Connectors.

3.6 PPS 9.34 - Terminating Electrical Shields.

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

3.8 PPS 9.41 - Termination of Individual Wire Shields at Glenair 550-003 & 557-581 Backshells.

3.9 PPS 9.45 - Removal of Installed Tinel-Lock Rings.

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

3.11 PPS 13.26 - General Subcontractor Provisions.

3.12 PPS 13.39 - DASH 8 & Lear 45 Critical and Special Processes PPS Index.

3.13 PPS 14.01 - Torquing & Tightening.

4 MATERIALS, EQUIPMENT AND FACILITIES

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 Teflon tape with silicone adhesive (e.g., DSC 91-3-1). The colour of the tape must be easily distinguishable from the colour of the surface on which it is being used.

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

4.1.4 Solder sleeves as specified in Table II and Table IV.

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

4.1.6 Band clamps and/or Tinel-Lock rings as specified by the engineering drawing.

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

4.1.8 Sealant for sealing convoluted tubing, MIL-A-46146 (i.e., Momentive RTV 160 or Dow Corning 3110).

4.1.9 NAS43 spacers, 2024-T aluminum alloy with a FC (chemical film) finish - i.e., Finish Code FC.

4.1.10 NAS1149DN332J washers.

4.2 Equipment

4.2.1 Needle nose pliers.

4.2.2 Shielded cable stripper (e.g., Ideal Ringer #45-404). Shielded cable strippers must be capable of cleanly cutting the outer jacket of shielded cable without damaging the braided shield.

4.2.3 Thermal knife (e.g., Meisei 201 Model 2A “HOTnife” with M-10 power supply or Hakko FT-8003 Hot Knife). Thermal knives must be capable of cleanly cutting the outer jacket of shielded wire and cable without damaging the braided shield or insulated conductors.

4.2.4 Hot tweezer wire stripper (e.g., Meisei 412 Model 4C HOTweezers with M-10 power supply or Hakko FT-801 Thermal Wire Stripper). Hot tweezers must be capable of cleanly cutting the outer jacket of shielded wire and cable without damaging the braided shield or insulated conductors.

4.2.5 Shield jacket stripping shop aid (e.g., SD 8962).

4.2.6 Flush or diagonal cutters (e.g., Hakko HJ3002 or HJ3016).

4.2.7 Hot air gun, complete with reflector (e.g., Steinel HG 2520E or Steinel STEI-HG 2310-BB). Hot air guns must be capable of heating a splice to the required temperature without over heating or damaging the splice or wire insulation. For safety reasons, it is recommended that hot air guns include a power interrupt reset feature which will prevent an unattended heat gun from resuming heat (e.g., after a power failure).

4.2.8 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.

4.2.9 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.

4.2.10 Tinel-Lock ring installation kits. A number of different kits (see following listing) are acceptable for use, depending upon the nature of the installation required and the power supply available.

- Cantwell Cullen 3CFU-TIMHT-XXX. This kit includes a specially modified hand tool (3CFU-TIMHT-01) for use in areas where close proximity of surrounding parts and/or structure make use of the unmodified hand tool difficult or impossible. This kit is available with a 110V transformer (3CFU-TIMHT-110) or 220V transformer (3CFU-TIMHT-220).
- Raychem RH-3960-1 kit, includes an unmodified hand tool and a 120V transformer.
- Raychem AD-5000 kit, includes an unmodified hand tool and a 220V - 240V transformer.
- Raychem 3CFU-TITK-120 kit, includes an unmodified hand tool and a 120V transformer.
- Raychem 3CFU-TITK-240 kit, includes an unmodified hand tool and a 240V transformer.

4.3 Facilities

4.3.1 This PPS has been categorized as a Controlled Special Process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform activities relating to installing/terminating braided shields for EMI and HIRF protection of wire harnesses on DASH 8 series 400 aircraft according to this PPS.

4.3.2 Subcontractors must direct requests for approval to DHC Quality.

4.3.3 Facility approval must be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report must detail the materials and equipment to be used, the process sequence to be followed and the laboratory facilities used to show compliance with the requirements of this PPS. Any deviation from the procedure or requirements of this PPS must be detailed in the facility report. Based upon the facility report, DHC Engineering may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification must be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from DHC Quality.

4.3.3.1 For approval of subcontractor facilities to perform activities relating to installing / terminating braided shields for EMI and HIRF protection of wire harnesses on DASH 8 series 400 aircraft according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples must meet the requirements specified in section 6.

5 PROCEDURE

5.1 General

5.1.1 Overbraid shields and individual wire shields are used to protect electrical wire bundles from electro-magnetic effects. Transitions exist within the overbraid when 2 or more branches intersect. Overbraid shields must be secured mechanically and electrically at connector adaptors, transition adaptors, and bulkhead adaptors. Individual shields must be terminated as specified on the engineering drawing or wiring list. See Figure 1 for a representation of a typical conduit system.

5.1.2 For the purposes of this PPS, the terms “adaptor” and “backshell” have been used to describe similar connector termination hardware which in some cases include various individual components which collectively form a backshell or adaptor assembly.

5.1.3 In general, solder sleeves with jumpers are used to terminate a) shields to connector pins/sockets, and b) shields to connector strain relief clamps. Solder sleeves with braid jumpers are used to terminate shields at compression type connector adaptors. In all cases SO63 type solder sleeves should only be used with silver/tin plated conductors and SO96 type solder sleeves should only be used with nickel plated conductors.

5.1.4 Prepare the wire harness as specified in PPS 9.04 before installing overbraid shields.

5.1.5 Ensure overbraid shields and individual wire shields are uniform, continuous and free of damage.

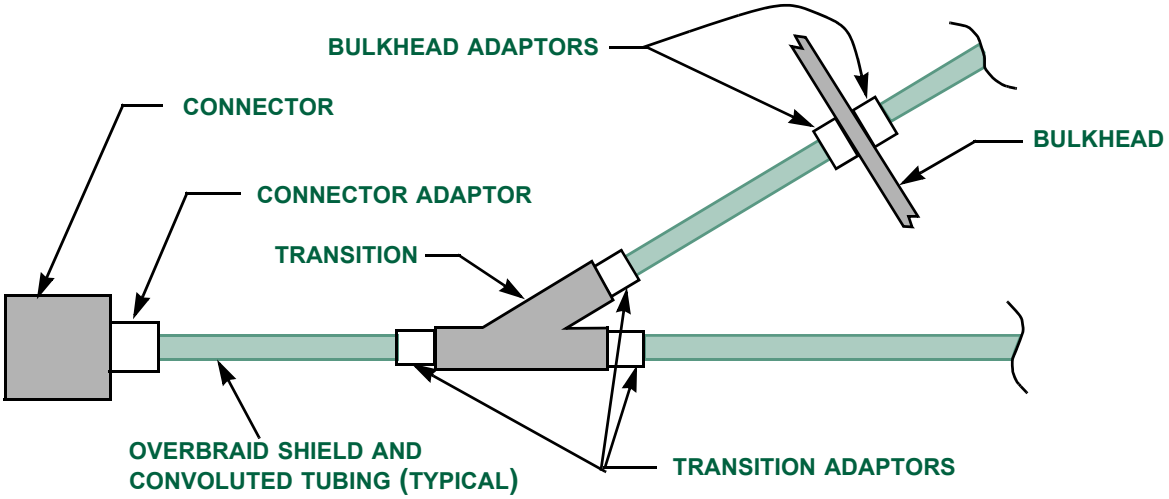


FIGURE 1 - CONDUIT SYSTEM (TYP.)

5.1.6 In all cases (especially for Optilock Composite “Rook” backshells), take care to ensure proper thread alignment when assembling threaded components (i.e., avoid cross threading), as misalignment may irreparably damage one or both components. Use the following procedure to avoid cross threading or misalignment of threads:

Step 1. Orient the components to be threaded together, so that they are centred properly on one another.

Step 2. Instead of immediately screwing the components in the direction necessary to engage the threads (i.e., clockwise), lightly place the thread components together and rotate slowly and gently counter-clockwise, with minimal engagement pressure, until you hear or feel a slight “click” indicating that the starting threads on both components are lined up.

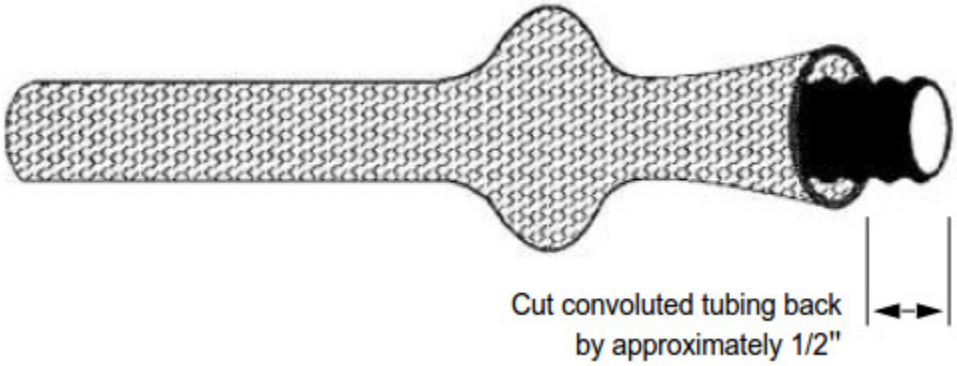
Step 3. Start to thread the components together by turning clockwise slowly and gently, with minimal engagement pressure, being careful to be aware of any unusual resistance. If any unusual resistance is encountered, back off and repeat from Step 2.

Step 4. Run threaded components together by hand before final torquing (ref. section 5.10).

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 following figure:



5.3 Removal of the Outer Jacket from Shielded Cables

5.3.1 Remove the outer jacket from shielded cables as follows:

Step 1. Select the appropriate stripping tool from the following list:

- For large or intermediate diameter, **round**, shielded cables or wires, it is recommended that a shielded cable stripper (ref. paragraph 4.2.2) be used. Set the depth of the blades and the curved blade on the front of the tool to approximately 3/4 of the thickness of the outer jacket (verify on a scrap piece of cable before stripping production parts).
- For intermediate diameter shielded wires or cables which are not **round**, use of a thermal knife (ref. paragraph 4.2.3) is recommended.
- For smaller diameter shielded wires, use of hot tweezers (ref. paragraph 4.2.4) is recommended.

Step 2. Determine the length of outer jacket to be removed and carefully make a circumferential cut through approximately 3/4 of the thickness of the outer jacket. Take care to avoid nicking the braided shield when cutting the outer jacket. If using a shielded cable stripper, position the tool so that the cable sits in the “V” notch directly under the side blade, rotate the tool once around the cable, and remove the tool.

Step 3. Flex the cable to propagate the notch through the jacket wall.

Step 4. Attempt to pull the outer jacket off the end of the wire to expose the braided shield. On large and intermediate diameter wires or cables use a rubber pad or length of rubber tubing to help pull off the jacket, if necessary. Avoid applying excessive force and take care not to damage the cable.

Step 5. If the outer jacket cannot be pulled off, make a lengthwise cut from the circumferential cut to the end of the wire. Take care to avoid nicking the braided shield when cutting the outer jacket. If using a shielded cable stripper, place the cable so that it sits in the “V” notch of the stripper, directly underneath the front blade, and slide the tool lengthwise along the cable. If using a thermal knife, place the cable in a shield jacket stripping shop aid (ref. paragraph 4.2.5) and use the thermal knife to score the jacket.

Step 6. Flex the cable in the area of the cut to propagate the notch through the jacket wall and remove the jacket.

5.4 Trimming Braided Shields

5.4.1 Slide the shield back on the cable to form a bulge and trim to length with a pair of scissors, flush cutters, or diagonal cutters (see Figure 2). Take care to avoid nicking or damaging the conductor insulation while cutting the braided shield.

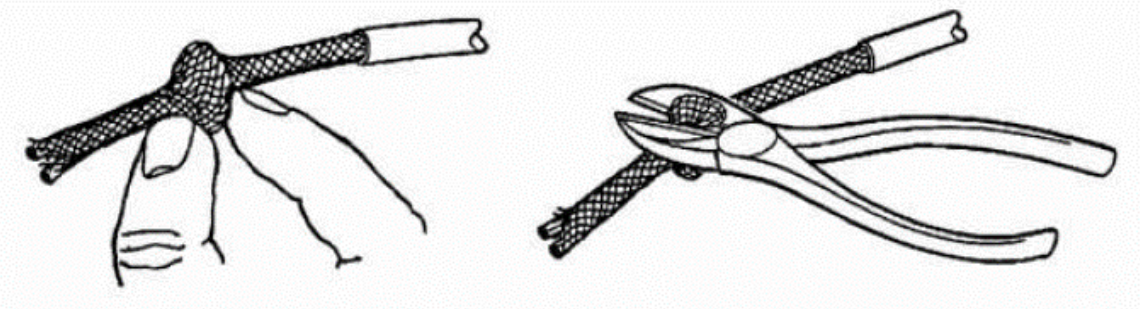


FIGURE 2 - TRIMMING BRAIDED SHIELDS

5.5 Termination of Overbraid and/or Individual Wire Shields at Adaptors, Transitions, Connectors and Backshells

5.5.1 Refer to Table I for the termination procedure to follow for each adaptor or connector.

TABLE I - TERMINATION PROCEDURES

COMPONENT	TERMINATION PROCEDURE	PARAGRAPH OR PPS REFERENCE
Deutsch DMC-MD (AHRS 3420)	Terminate the individual wire shields at the connector.	5.5.6
Glenair 527 Series Connectors	Terminate the individual wire shields to the grounding rings.	5.5.9
Glenair 550-003 Backshells	Terminate the individual wire shields at Glenair 550-003 backshells.	PPS 9.41
3CFU	Terminate the overbraid to the adaptor.	5.5.2
Optilock Backshells (3CGA, 3CFUGA and OL series)	Terminate overbraid at the backshelll.	5.5.2
	If the Engineering drawing specifies termination of individual shields using braid straps, terminate the individual wire shields to the holed or slotted grounding adaptor.	5.5.3
	If the Engineering drawing specifies termination of individual shields using jumper wires and terminal lugs, terminate the individual wire shields to the strain relief clamp or grounding lug.	5.5.4
3CSR	Connect the individual wire shields to the strain relief clamp.	5.5.4
Optilock Composite “Rook” Backshells	Terminate the individual wire shields to the grounding “rook”.	5.5.10
Positronic D50000GVLO	For harnesses within overbraid, terminate the overbraid and individual wire shields at the connector.	5.5.7
	For harnesses which are not within overbraid, terminate the individual wire shields at the connector.	5.5.8
M85049	Connect the individual wire shields to the strain relief clamp.	5.5.4
Souriau Pelican PEL1-ECF-3522	Terminate the individual wire shields at the connector.	5.5.5

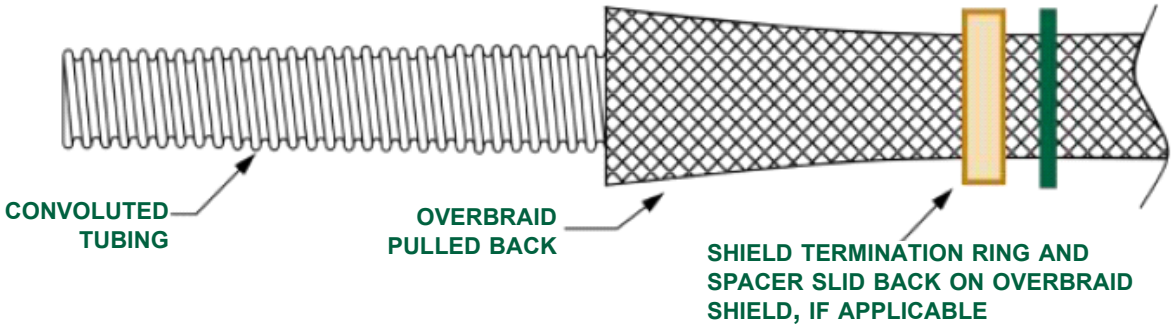
5.5.2 Terminate overall shields and convoluted tubing at 3CFU and Optilock backshells (3CGA, 3CFUGA and OL series) as follows:

Step 1. Slide the identification sleeve (if specified on the engineering drawing or wiring list) onto the overbraid shield.

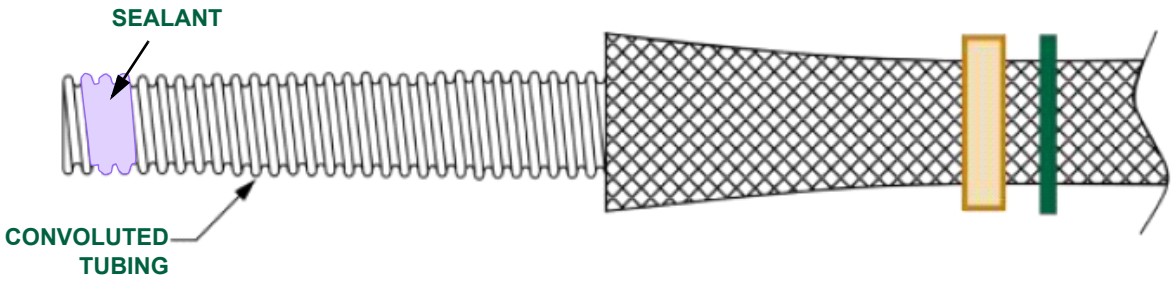
Step 2. If the overbraid shield is to be terminated using a Tinel-Lock ring, slide the shield termination ring (Tinel-Lock ring) and spacer onto the overbraid shield.

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

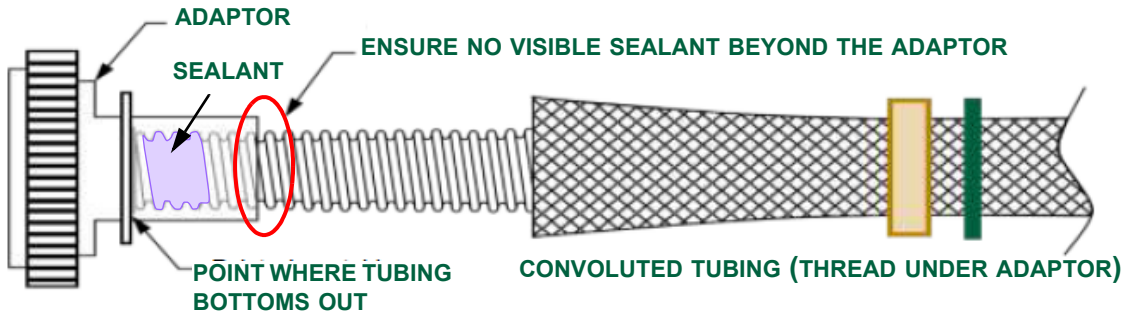
Step 4. Pull back the braid to expose approximately 6" of the convoluted tubing. Use Teflon tape to hold it temporarily in place as shown below.



Step 5. Apply a minimal amount of MIL-A-46146 sealant (ref. paragraph 4.1.8) to the first few threads of the convoluted tubing as shown below.



Step 6. Thread the adaptor on top of the inner convoluted tubing until the tubing bottoms out on the inside of the adaptor as shown in the following figure. Do not over tighten the adaptor since this may deform the convoluted tubing. Remove any excess sealant that may have extruded out of the adaptor.



Step 7. Terminate the overall shield at the termination land on the adaptor as shown in Figure 3 with a band clamp, or a spacer and Tinel-Lock ring, as specified by the engineering drawing or wiring list. Install Tinel-Lock rings according to the procedure specified in section 5.11. Install band clamps according to the procedure specified in section 5.12.

Step 8. Secure the adaptor to the connector, transition, or bulkhead as specified in section 5.10.

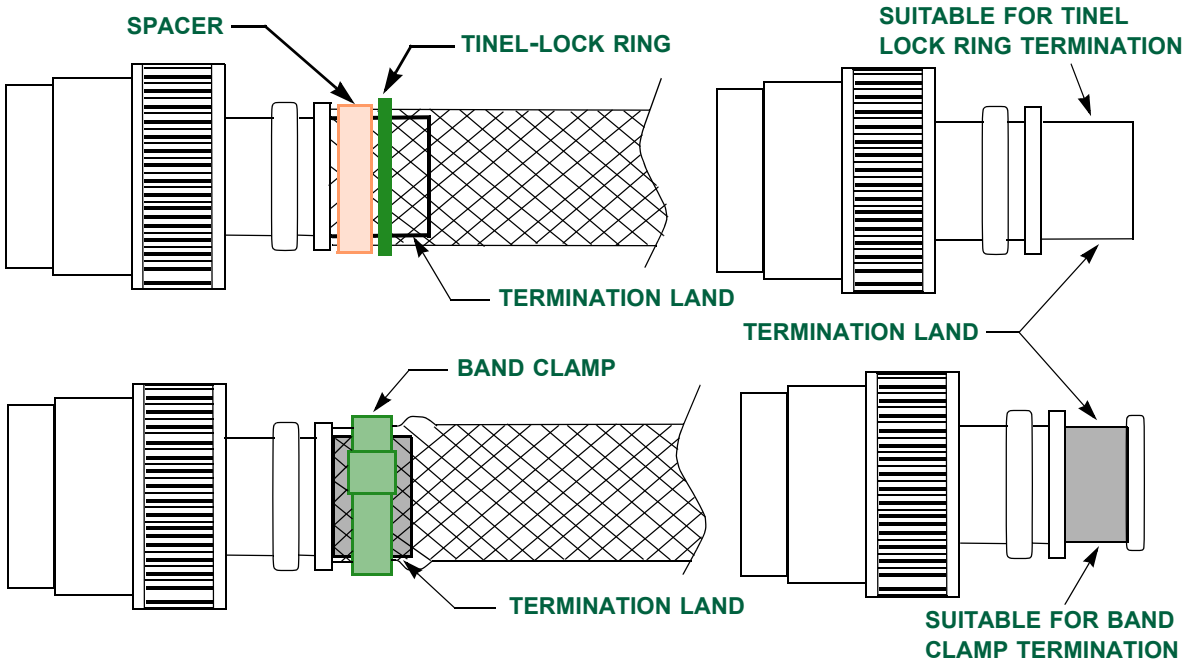
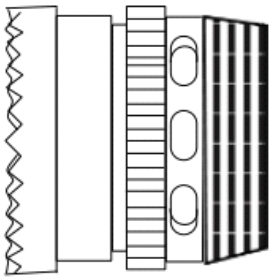


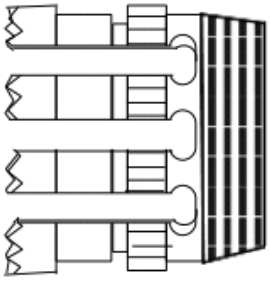
FIGURE 3 - TERMINATION OF OVERBRAID SHIELDS AT 3CFU AND OPTILOCK BACKSHELLS (3CGA, 3CFUGA AND OL SERIES)

5.5.3 Terminate individual wire shields at Optilock backshells utilizing grounding adaptors with holes (3CGA and 3CFUGA) and Optilock backshells utilizing grounding adaptors with slots (OL series) using solder sleeves with pre-installed braid straps as follows.

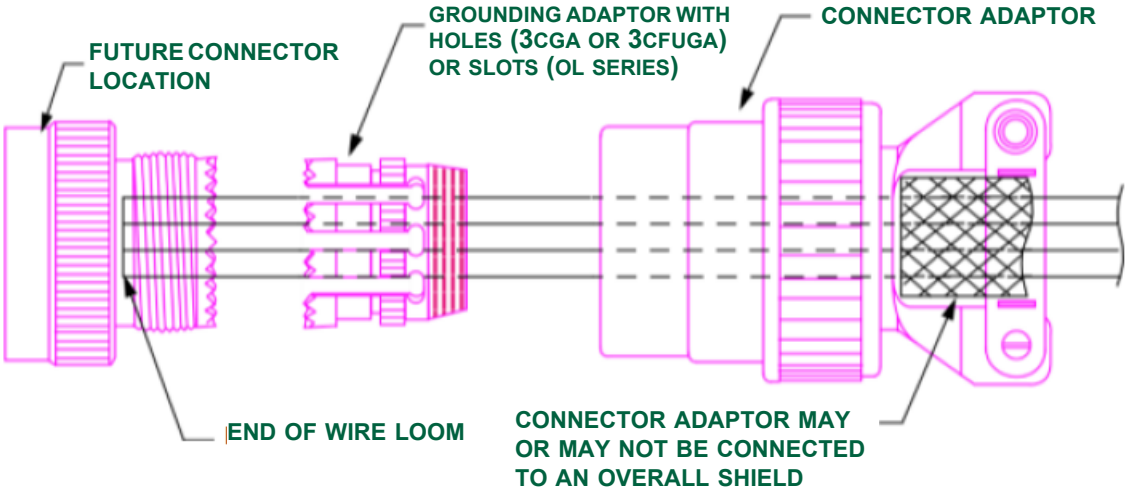
Step 1. Slide the grounding adaptor and the connector adaptor onto the wire loom as shown in the following figure. The connector adaptor may already be connected to an overall shield; if this is the case, slide the entire assembly onto the wire loom



OPTILOCK BACKSHELL GROUNDING ADAPTOR WITH HOLES (3CGA & 3CFUGA)



OPTILOCK BACKSHELL GROUNDING ADAPTOR WITH SLOTS (OL SERIES)

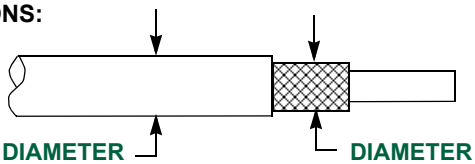


Step 2. Terminate the braided shields of each of the individually shielded cables in the loom according to section 5.7 using solder sleeves with pre-installed braid straps. If the engineering drawing does not specify the solder sleeve, use the solder sleeve specified in Table II.

TABLE II - SOLDER SLEEVES WITH PRE-INSULATED BRAID STRAPS (NOTE 1)

OUTSIDE DIAMETER OF CABLE	DHC SOLDER SLEEVE PART NUMBER	MINIMUM DIAMETER OF BRAIDED SHIELD (NOTE 2)
0.040" - 0.100"	B0816063-1	0.036"
0.101" - 0.140"	B0816063-2	0.056"
0.141" - 0.195"	B0816063-3	0.082"
0.196" - 0.250"	B0816063-4	0.132"
0.251" - 0.295"	B0816063-5	0.173"

CABLE DIMENSIONS:



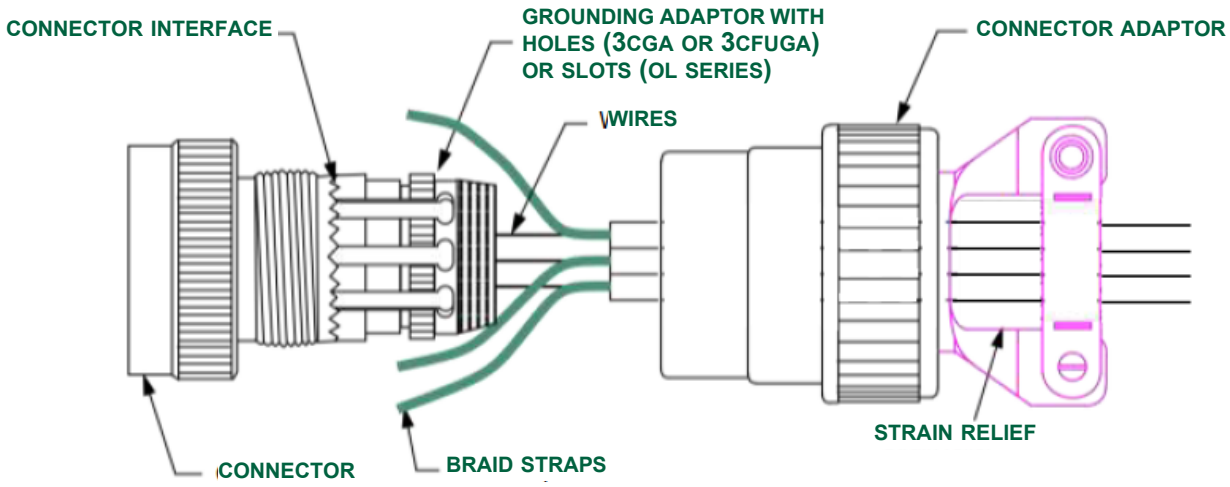
Note 1. The braid straps listed herein are for use with tin and silver plated shields ONLY.
Note 2. If the diameter of the braided shield is less than the specified minimum, contact Liaison Engineering.
Note 3. In order to minimize build-up of the wire loom, ensure that the correct size braid strap is selected for each of the exposed shields.

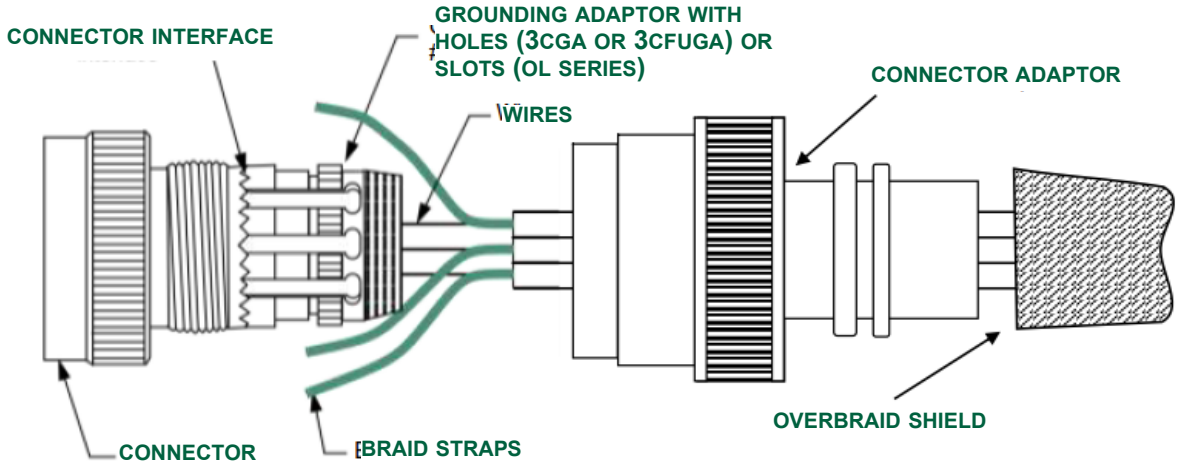
Step 3. Terminate each of the wires in the loom with crimp contacts according to PPS 9.19 (Automatic Crimping of Size 16 - 22 Electrical Contacts) or PPS 9.36 (Manual Crimping of Size 12 - 22 Contacts).

Step 4. Assemble the crimp contacts to the connector according to PPS 9.22.

Step 5. Fold the braid straps back so that they are flush with the wire loom.

Step 6. Slide the grounding adaptor over the wire loom so that its teeth mesh with the teeth of the connector as shown in the following figure. A small piece of Teflon 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.

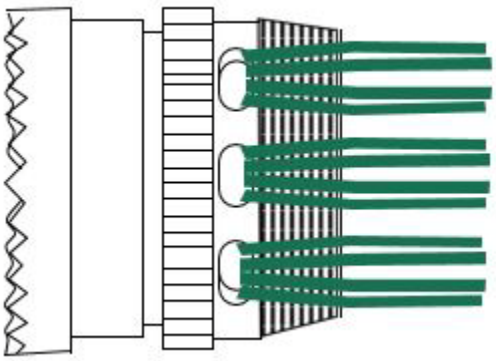




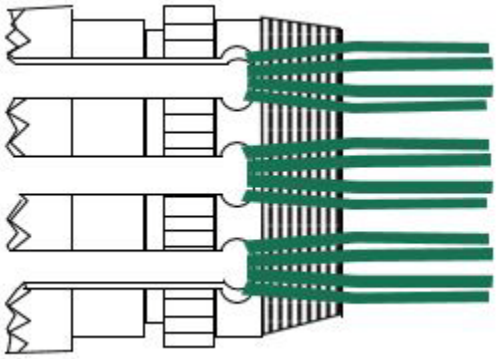
Step 7. Insert one of the braid straps through one of the holes or slots in the grounding adaptor, routing from the inside of the adaptor outwards.

Step 8. Insert a second braid strap into a hole or slot on the opposite side of the grounding adaptor from the inside of the grounding adaptor outwards. Inserting the first two straps opposite one another helps hold the grounding adaptor in place.

Step 9. Continue to insert the remaining braid straps from the inside of the grounding adaptor outwards. Table III lists how many braid straps can be accommodated in each size of grounding adaptor. Distribute the braid straps evenly around the grounding adaptor. Ensure that the braid straps do not overlap one another and that they remain flat as shown below. It is essential that an even diameter is maintained around the grounding adaptor.



GROUNDING ADAPTOR WITH HOLES (3CGA & 3CFUGA)



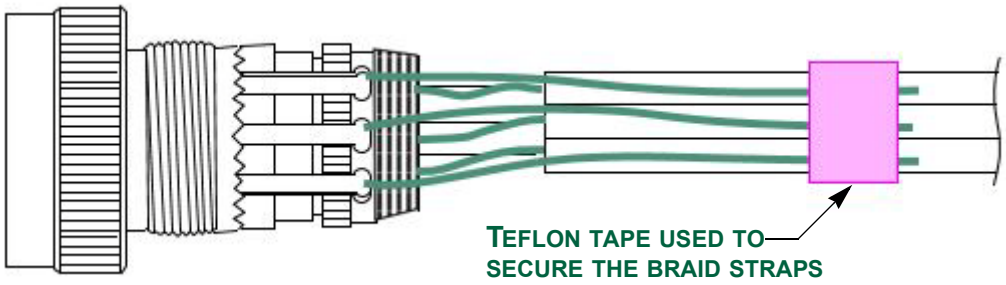
GROUNDING ADAPTOR WITH SLOTS (OL SERIES)

TABLE III - MAXIMUM NUMBER OF BRAID STRAPS PER GROUND ADAPTOR

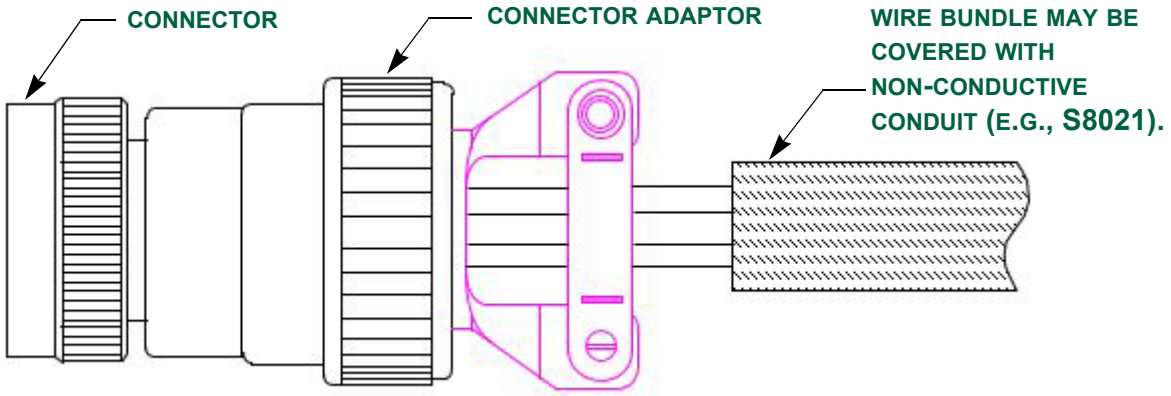
Shell Size	Number of Holes or Slots	Size of Slots	Maximum Number of Braid Straps Per Slot	Maximum Number of Braid Straps
08 / 09 (A)	2	0.24"	4	8
10 / 11 (B)	3			12
12 / 13 (C)	4			16
14 / 15 (D)	5			20
16 / 17 (E)	6			24
18 / 19 (F)	8			32
20 / 21 (G)	8	0.30"	5	40
22 / 23 (H)				
24 / 25 (J)	10			50

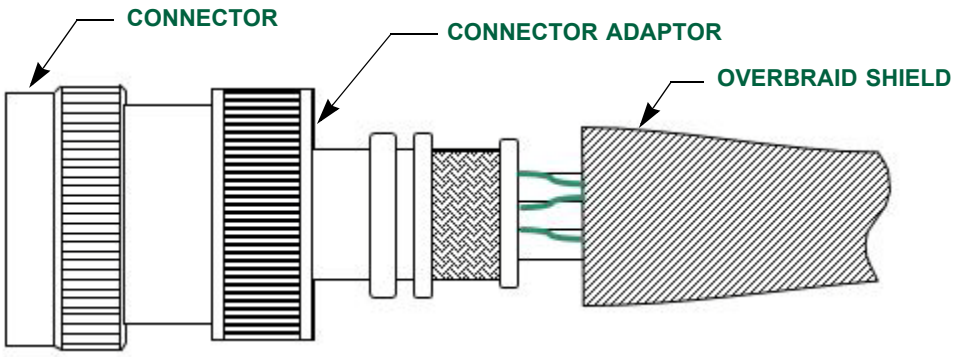
Step 10. Remove any tape which is being used to hold the shield termination module in place.

Step 11. Smooth the braid straps along the wire bundle and tuck them in between the wires of the wire loom so that they do not catch on the adaptor or overbraid shield. If necessary, a single wrap of Teflon tape with minimal overlap can be used to hold the straps in place while positioning the adaptor.



Step 12. Slide the connector adaptor over the shield termination module. If there are a lot of wires in the wire loom, it may be necessary to manipulate the wires while sliding the adaptor into place. Ensure that the individual wire shields extend within the connector adaptor when the connector adaptor is in its final position.

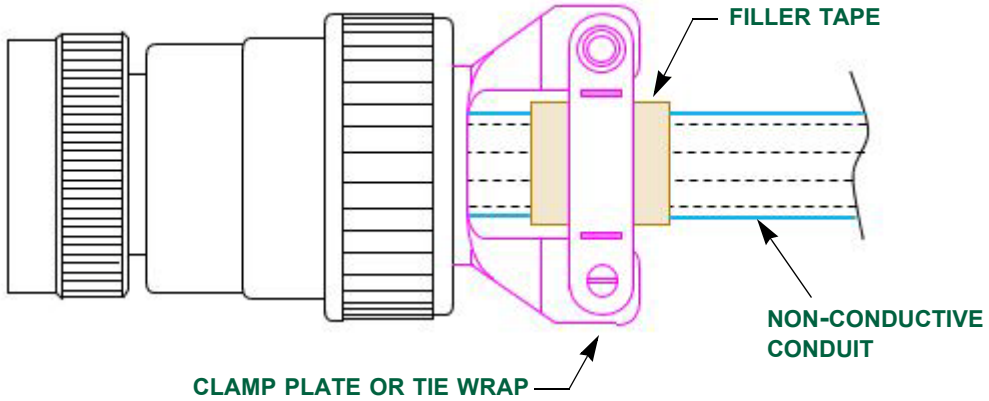




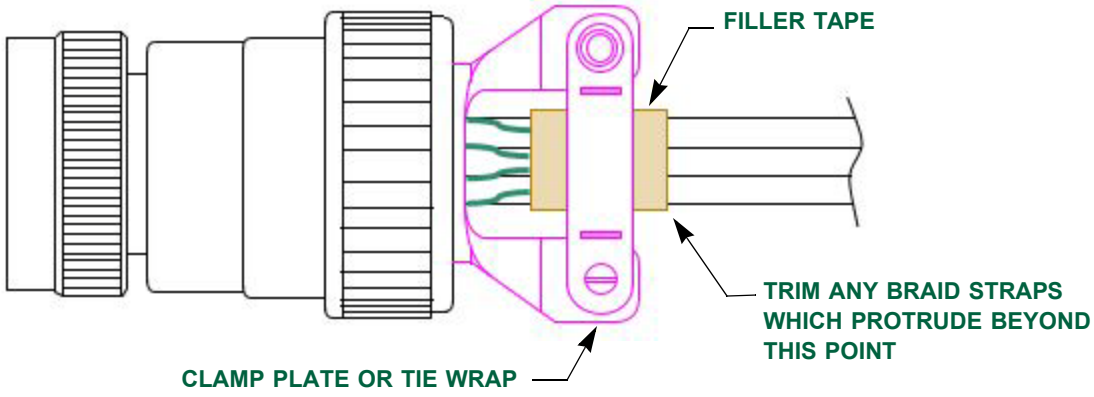
Step 13. Secure the connector adaptor to the connector, transition, or bulkhead as specified in section 5.10.

Step 14. For wire bundles covered with an overbraid shield, terminate the overbraid at the connector adaptor as specified in paragraph 5.5.2. Where an overbraid shield covers the wire bundle, Teflon tape used to secure the braid straps does not have to be removed.

For wire bundles covered with non-conductive conduit (e.g., S8021), if the connector adaptor is equipped with a strain relief clamp wrap the wire loom with filler tape if necessary to ensure that the clamp has a secure grip on the conduit. Where non-conductive conduit covers the wire bundle, Teflon tape used to secure the braid straps does not have to be removed.



For wire bundles which are not covered with an overbraid shield or non-conductive conduit, wrap the wire loom with filler tape in the area of the strain relief clamp, if any, to ensure that the clamp has a secure grip on the loom and to secure the braid straps. For connector adaptors which do not include a strain relief clamp, wrap the wire loom with filler tape in the area in which the strain relief clamp would have been to secure the braid straps and install a plastic cable tie over the filler tape according to PPS 9.04. If the connector adaptor being used has a strain relief clamp, tighten the clamp around the filler tape and wire loom. Trim any braid straps which are protruding from beyond the filler tape.



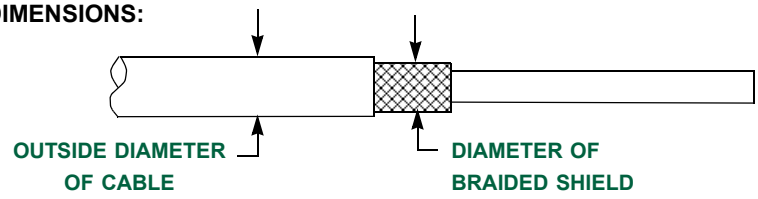
5.5.4 Where the engineering drawing specifies termination of individual wire shields using jumper wires and terminal lugs at M85049, 3CSR and Optilock backshells (3CGA, 3CFUGA and OL series), terminate the individual wire shields to the strain relief or adaptor ground lug, as applicable, as follows:

Step 1. Terminate the braided shields of each of the individually shielded cables in the loom as specified in section 5.7 using the smallest possible solder sleeve (complete with pre-installed jumper wire). If the engineering drawing does not specify the solder sleeve to be used, refer to Table IV.

TABLE IV - SOLDER SLEEVES WITH PRE-INSTALLED JUMPER WIRES

MAXIMUM OUTSIDE DIAMETER OF CABLE	RAYCHEM SOLDER SLEEVE (NOTES 1, 2 & 3)	MINIMUM DIAMETER OF BRAIDED SHIELD
0.075"	SO63-1-82-22-90 or SO63-1-55-22-5	0.035"
0.105"	SO63-2-82-22-90 or SO63-2-55-22-5	0.055"
0.170"	SO63-3-82-22-90 or SO63-3-55-22-5	0.085"
0.235"	SO63-4-82-22-90 or SO63-4-55-22-5	0.130"
0.280"	SO63-5-82-22-90 or SO63-5-55-22-5	0.170"

CABLE DIMENSIONS:



Note 1. The solder sleeves listed herein are for use with tin and silver plated shields ONLY.
Note 2. For termination of inserting the jumper wire of a SO63-X-82-22-90 solder sleeve due to its flexibility, it is recommended that the appropriate size SO63-X-55-22-5 solder sleeve be used.
Note 3. When a longer jumper is required or there is no stock of the solder sleeves specified in this table, it is acceptable to use jumper wire to B0801150-* cut to the appropriate length, together with one of the following solder sleeves: B0816045-*, BACS13BH*, SO63*R or M83519/1*. (* denotes size).

Step 2. Terminate the jumper wires in terminal lugs as specified in section 5.9.

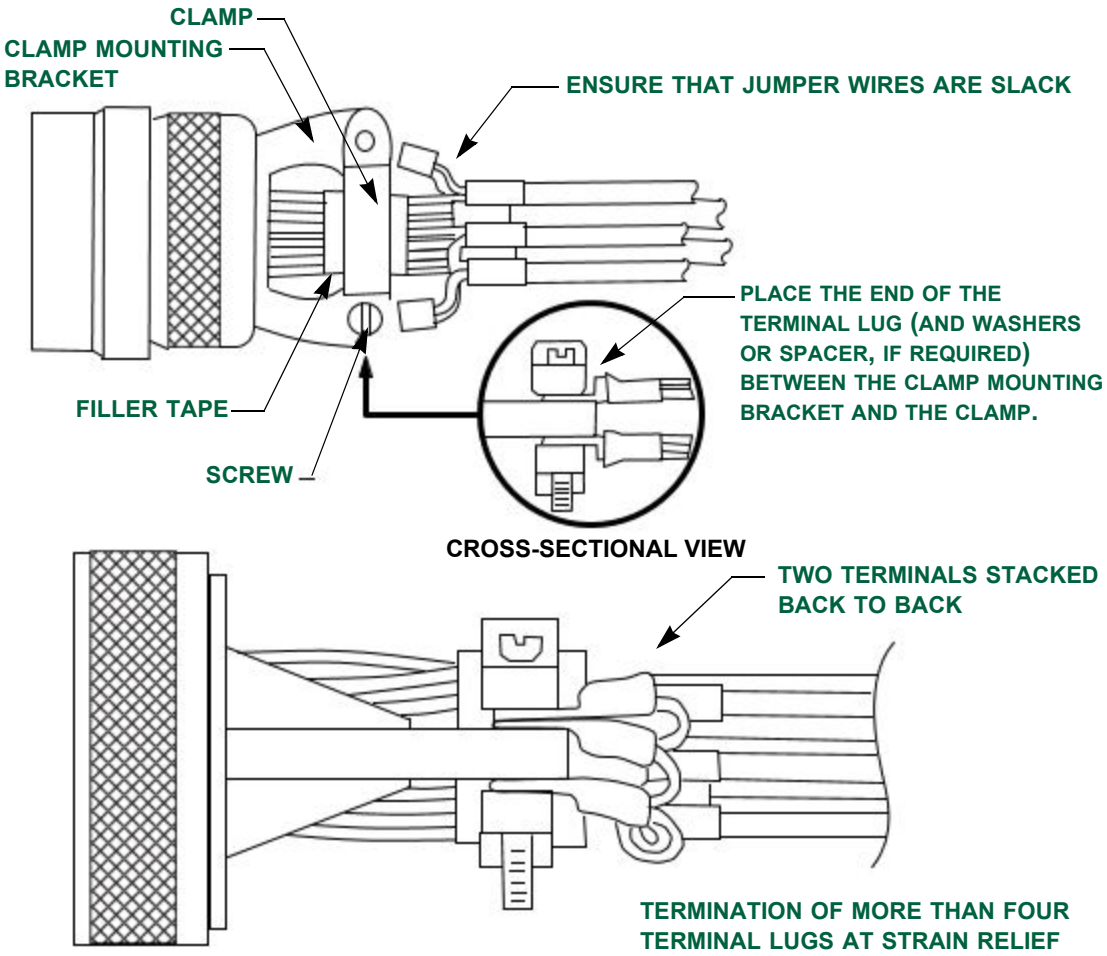
Step 3. Slide the connector adaptor onto the wire loom.

Step 4. Terminate the wires in the wire loom 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 5. Assemble the contacts to the connector according to PPS 9.22.

Step 6. Secure the adaptor to the connector, transition, or bulkhead as specified in section 5.10.

Step 7. Fasten the terminal lugs to the strain relief clamp as shown in the following figure. Distribute the terminals as evenly as possible between the left and right sides of the strain relief clamp to ensure that the clamp is reasonably balanced. If more than four terminal lugs (sixteen jumper wires) are being terminated, stack two terminals back to back as shown in the following figure. A maximum of six terminal lugs (twenty-four jumper wires) may be terminated at a single strain relief clamp. The strain relief clamp must have metal to metal contact between the screws, clamps, terminal lugs, and clamp mounting bracket at both fastener locations. Include NAS1149DN332J washers or an NAS43 spacer with a FC (chemical film) finish, if necessary to ensure metal to metal contact. If the engineering drawing or wiring list specifies the use of AN960D3 or NAS1149DN332J washers, it is acceptable to substitute an NAS43 spacer with a FC (chemical film) finish. For termination at a ground lug, orient the terminal lugs so that they do not impinge upon each other (e.g., offset and/or stack back to back if necessary).



Step 8. Tighten the strain relief clamp around the wire loom. If necessary, wrap the wire loom with filler tape to ensure that the clamp has a secure grip on the loom.

5.5.5 Terminate cable bundles at Souriau Pelican PEL1-ECF-3522 series connector kits as follows:

Step 1. Slide the “chimney” and shell onto the cable bundle (see Figure 4).

Step 2. Terminate the braided shields of each of the individually shielded cables in the loom according to section 5.7 using solder sleeves with pre-installed braid straps. If the engineering drawing does not specify the solder sleeve to use, refer to Table II.

Step 3. Terminate each of the wires in the loom 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 4. Assemble the crimp contacts to the connector according to PPS 9.22.

Step 5. Slide the shell into place around the connector.

Step 6. Secure the chimney (securing hardware) to the cable bundle as specified in PPS 9.22. Ensure that the filler tape extends beyond the end of the chimney (see Figure 4). Position the chimney so that the hood will fit in the groove of the chimney.

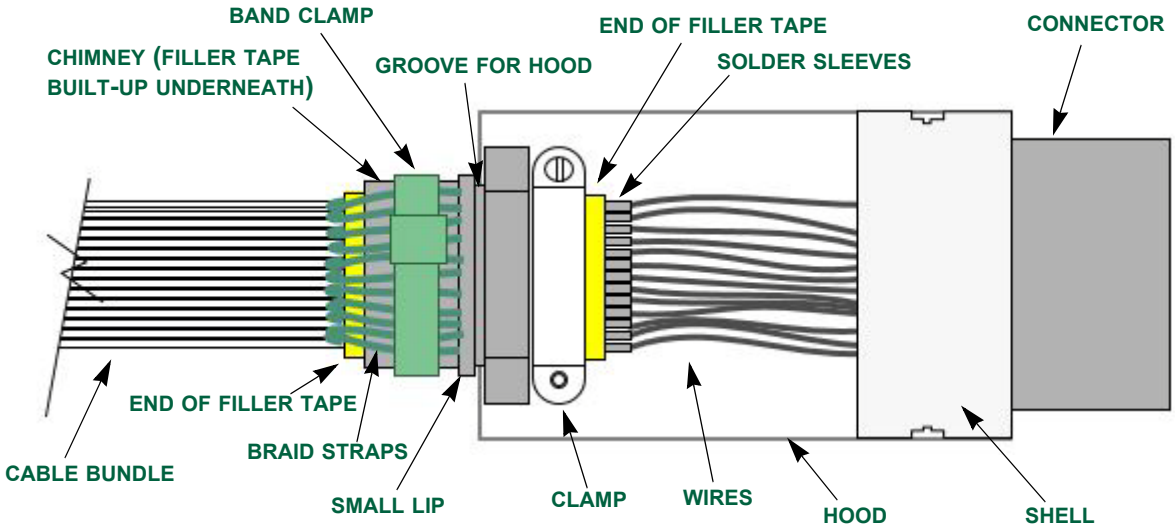


FIGURE 4 - SOURIAU PELICAN PEL1-ECF-3522 SERIES CONNECTOR KIT

Step 7. Evenly distribute the braid straps around the chimney.

Step 8. Install a band clamp around the chimney to hold the braid straps in place. Center the band clamp on the chimney. Ensure there is no tension on the secured braid straps (i.e., a slight amount of slack is desirable; the braid straps should not be pulled up tightly).

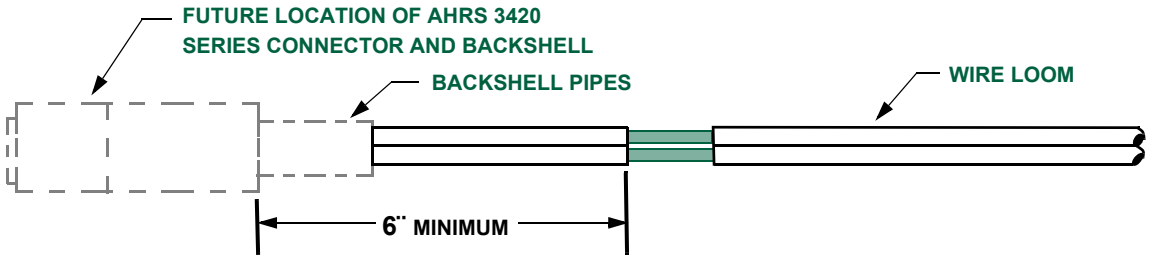
Step 9. Trim the braid straps flush with the small lip on the chimney. Ensure that the straps do not overlap the groove for the hood.

Step 10. Position both halves of the hood in the groove on the chimney and secure them to the chimney using the screws provided.

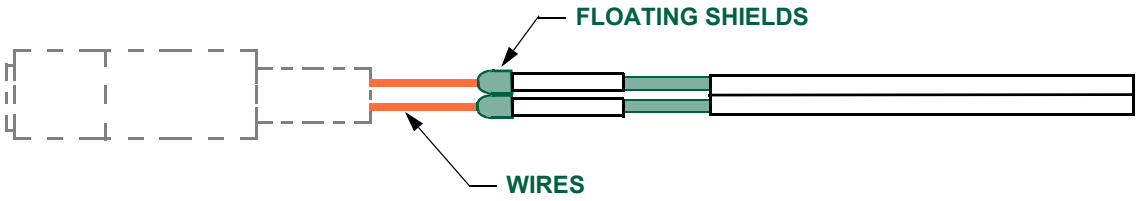
Step 11. Fasten the hood to the shell using the screws provided.

5.5.6 Terminate harness overbraid and individual wire shields at Deutsch DMC-MD (AHRS 3420 series) connectors as follows:

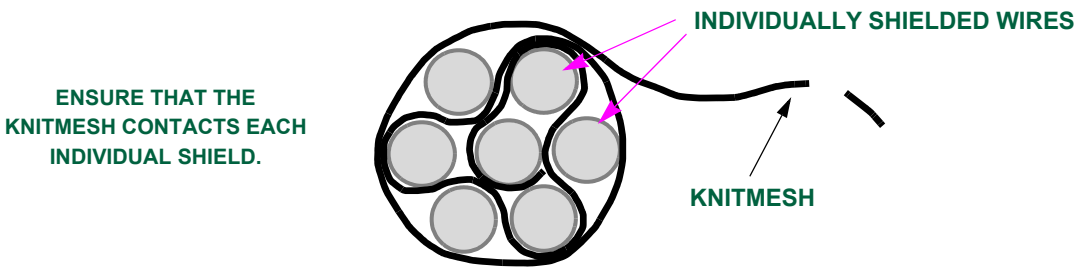
Step 1. Use a hot tweezer wire stripping tool to remove a 1" section of the outer insulation to expose the shield at least 6" from the rear of the connector backshell. Take care not to damage the shield when removing the outer layer of insulation.



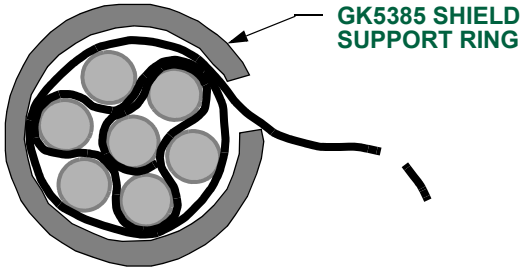
Step 2. Terminate each of the individual wire shields with floating shields according to PPS 9.34 as shown below.



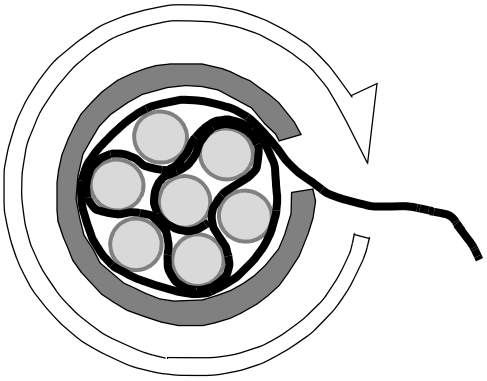
Step 3. Wrap a length of knitmesh (ref. paragraph 4.1.5) around and through the exposed shields of the wire loom as shown (cross-sectional view).



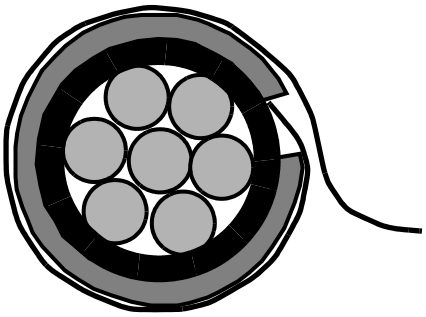
Step 4. Position a GK 5385 shield support ring over the exposed shields and feed the end of the braid through the slot in the ring as shown.



Step 5. 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.

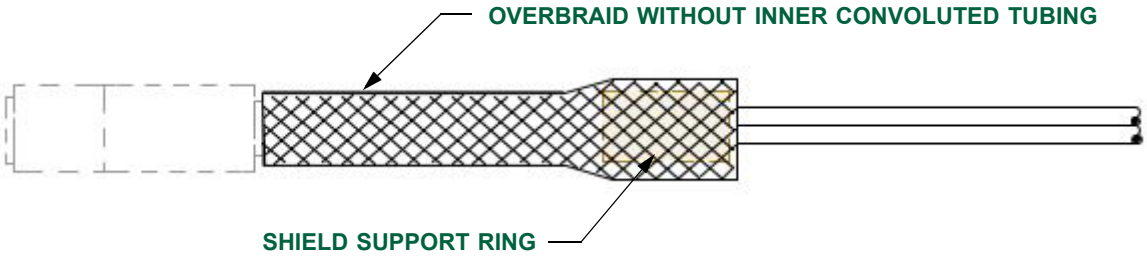


Step 6. Wrap the knitmesh around the outside of the shield support ring as shown:

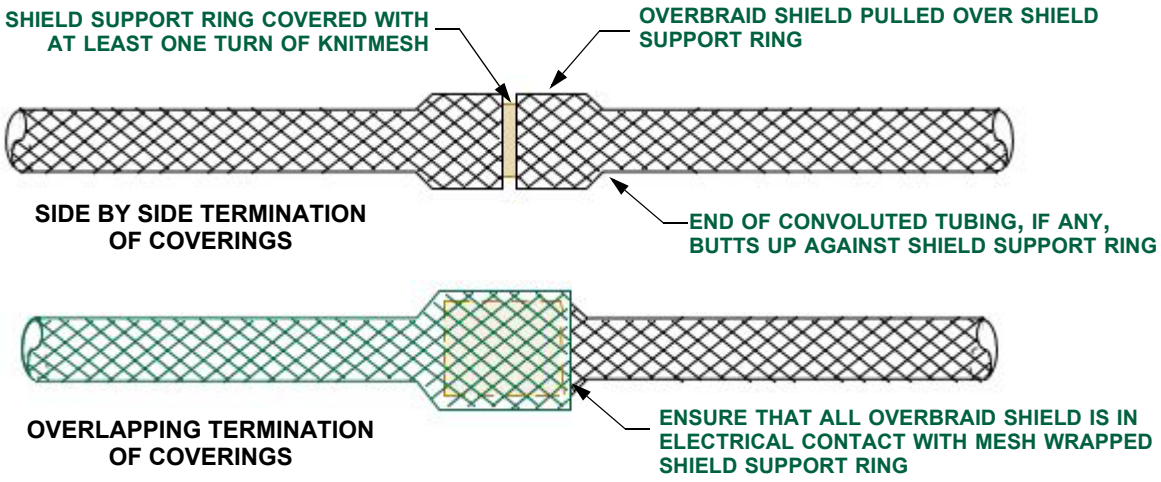


Step 7. Trim off the knitmesh after at least one full turn and secure it to the shield support ring using a nylon lacing tape tie (ref. paragraph 4.1.7).

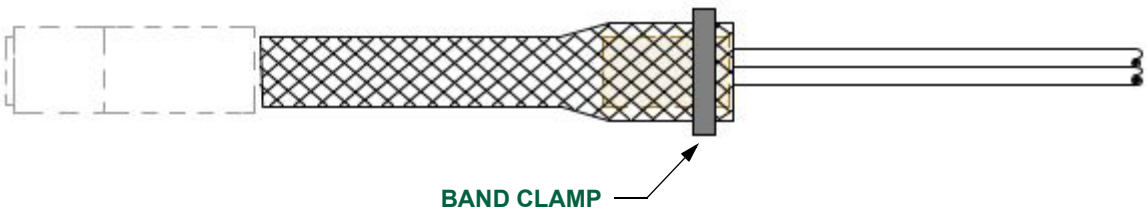
Step 8. Cut a length of overbraid to extend from the rear of the backshell to the end of the shield support ring and slip this length of overbraid onto the wire loom as shown below:



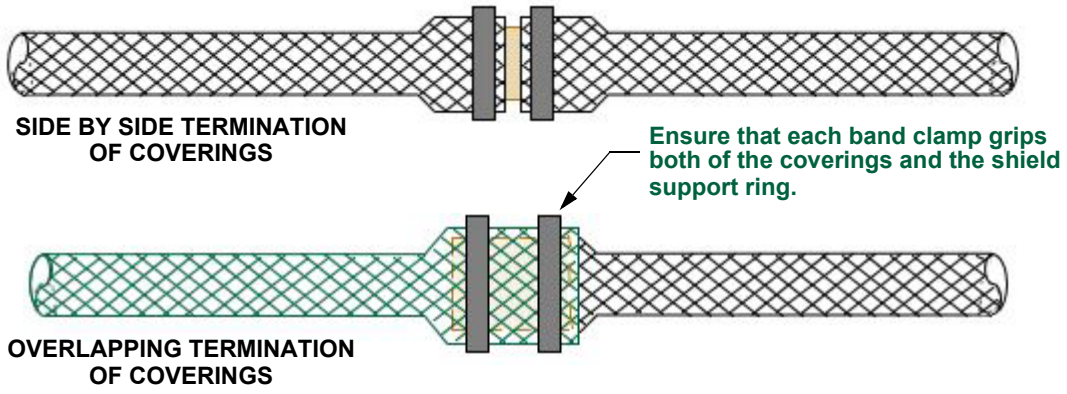
Step 9. Terminate wire loom coverings such as overbraid shields and DSC 300 sleeving at the GK 5385 support ring. If convoluted tubing is present, pull it up until the end of the tubing butts up against the shield support ring. The overbraid may terminate side by side or may overlap one another as shown 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.



Step 10. If there is no covering specified for the wire loom, use a band clamp to secure the overbraid to the shield support ring as shown:



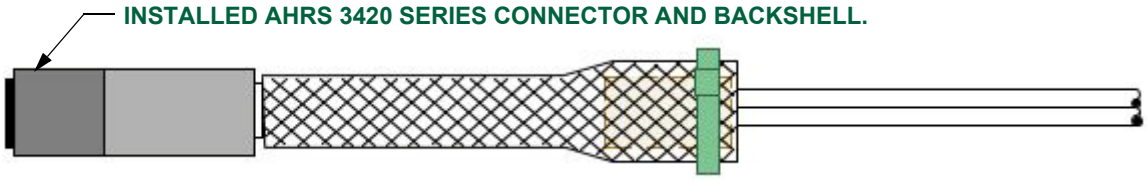
Step 11. If a wire loom covering is specified, use band clamps to secure the wire loom coverings to the shield support ring as shown in the following figure. If the coverings terminate side by side, install a separate band clamp at the end of each covering. If the coverings overlap, install two band clamps so that each of the clamps grips both of the coverings and the shield support ring.



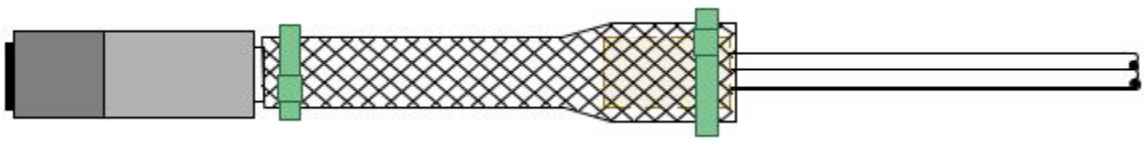
Step 12. Slip a length of heat shrinkable sleeving, long enough to oversleeve the braid from the backshell pipes to approximately 1" beyond the shield support ring, over the wire loom. Do **not** shrink the sleeving in place at this time.

Step 13. Terminate each of the wires in the loom 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).

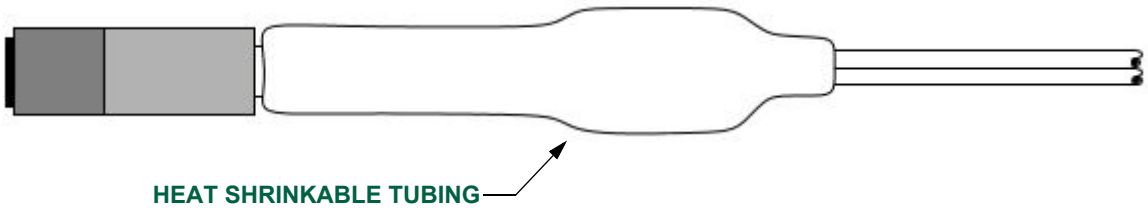
Step 14. Install the connector according to the procedure specified in PPS 9.22.



Step 15. Use a band clamp to secure the overbraid to the backshell pipes as shown:



Step 16. Pull up the heat shrinkable sleeving to oversleeve the braid from the backshell pipes to approximately 1" beyond the shield support ring. Shrink the heat shrinkable sleeving in place according to PPS 10.16.

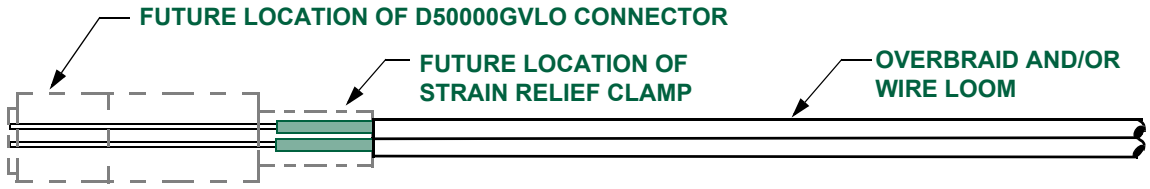


5.5.7 At Positronic D50000GVLO connectors, terminate the overbraid shield and individual wire shields of harnesses which include overbraid shielding as follows. Refer to paragraph 5.5.8 for the procedure for terminating harnesses which do not include overbraid shielding.

Step 1. Trim the overbraid, if any, so that it will extend to cover the individual wire shields beneath the strain relief clamp.

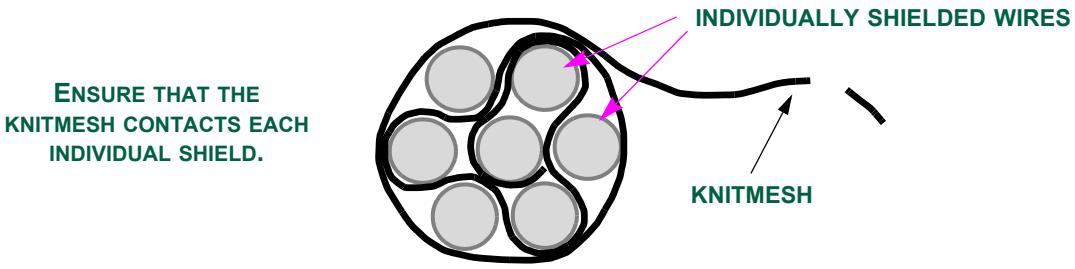
Step 2. Trim back the convoluted tubing to terminate approximately 1" from the strain relief clamp of the connector.

Step 3. For each wire, strip the outer jacket to expose the individual wire shield and then trim back the individual wire shield as shown below (i.e., so that individual wire shields are exposed beneath the strain relief clamp). Take care not to damage the shield when removing the outer layer of insulation.



Step 4. Terminate each of the wires in the loom 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 5. Pull back the overbraid and wrap a length of knitmesh (ref. paragraph 4.1.5) around and through the exposed individual wire shields as shown (cross-sectional view).



Step 6. Install contacts in the connector according to PPS 9.22.

Step 7. Pull up the overbraid so that it extends to cover the knitmesh wrapped through and around the individual wire shields.

Step 8. Tighten the strain relief clamp so that the strain relief clamps down on the overbraid shield and the wire knitmesh at the location of the individual bare shields.

5.5.8 At Positronic D50000GVLO connectors, terminate the individual wire shields of harnesses which **do not** include overbraid shielding as follows. Refer to paragraph 5.5.7 for the procedure for terminating harnesses which include overbraid shielding.

Step 1. Terminate the braided shields of each individually shielded cable in the loom according to section 5.7 using solder sleeves with pre-installed jumper wires. If the solder sleeve to be used is not specified by the engineering drawing, use the solder sleeve specified in Table IV.

Step 2. Terminate the jumper wires in terminal lugs as specified in section 5.9.

Step 3. Terminate the wires in the wire loom 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 4. Assemble the contacts to the connector according to PPS 9.22.

Step 5. Fasten the terminal lugs to the strain relief clamp as shown in Figure 5.

- Include NAS1149DN332J washers or an NAS43 spacer with an FC (chemical film) finish, if necessary, to ensure metal to metal contact between the screws, clamps, terminal lugs, washers (or spacer) and clamp mounting bracket at both fastener locations. If the engineering drawing or wiring list specifies the use of AN960D3 or NAS1149DN332J washers, it is acceptable to substitute an NAS43 spacer with an FC (chemical film) finish.
- Distribute the terminal lugs as evenly as possible between the left and right sides of the strain relief clamp to ensure that the clamp is reasonably balanced.
- If more than four terminal lugs (sixteen jumper wires maximum) are being terminated, stack two terminals back to back.
- A maximum of six terminal lugs (twenty-four jumper wires maximum) may be terminated at a single strain relief clamp.

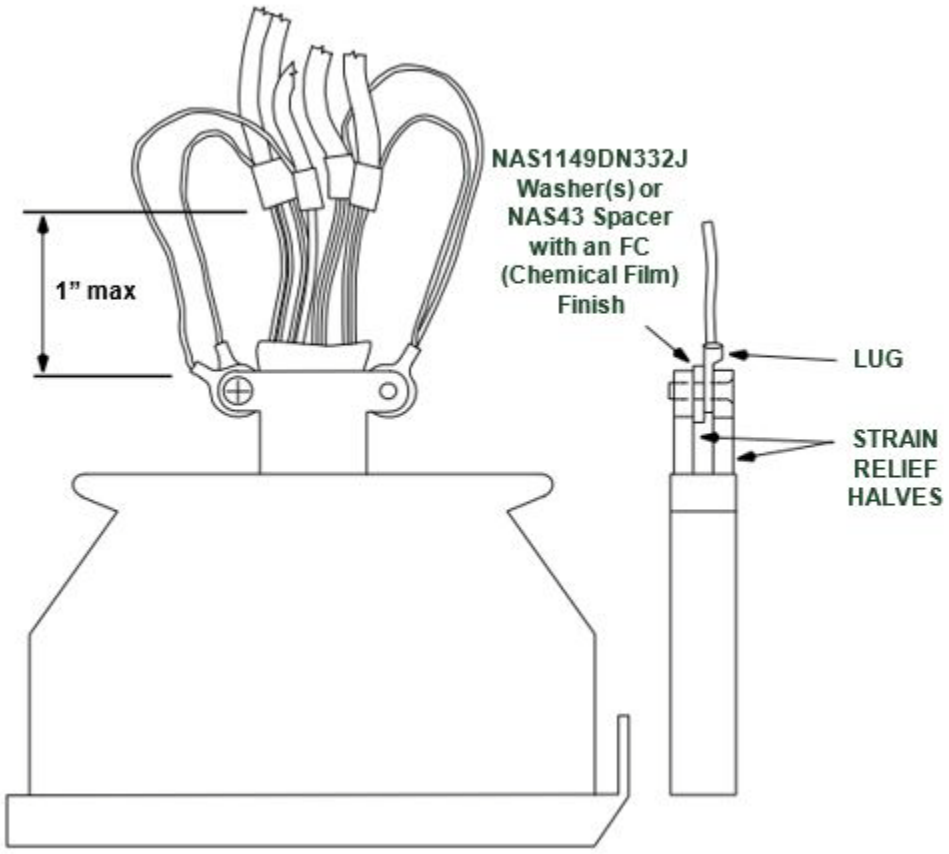
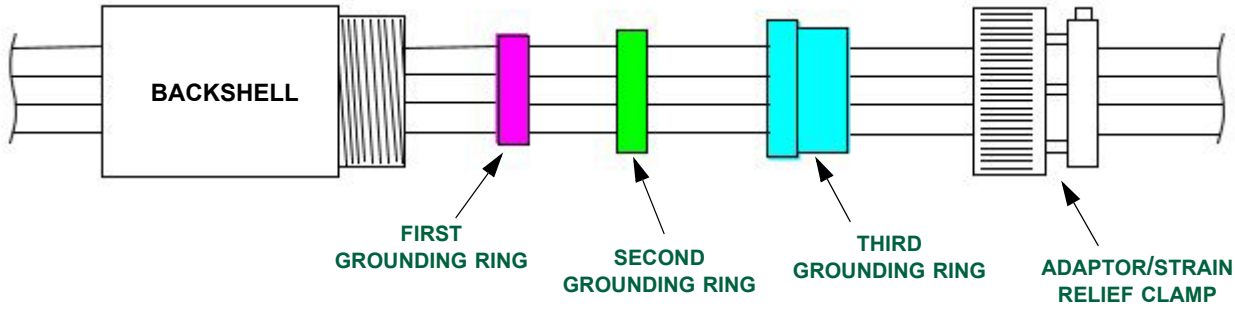


FIGURE 5 - TERMINATION OF INDIVIDUAL WIRE SHIELDS AT POSITRONIC D50000GVLO CONNECTORS

Step 6. Tighten the strain relief clamp around the wire loom. If necessary, wrap the wire loom with filler tape to ensure that the clamp has a secure grip on the loom.

5.5.9 At Glenair 527 series backshells with 3 grounding rings, where termination of an overbraid shield is not specified, terminate the individual wire shields of harnesses as follows:

Step 1. Slide the backshell, grounding rings and adaptor/strain relief clamp onto the wire loom as shown below:



Step 2. Terminate the braided shields of each of the individually shielded cables in the loom according to section 5.7 using solder sleeves with pre-installed braid straps. If the engineering drawing does not specify the solder sleeve, use the solder sleeve specified in Table II.

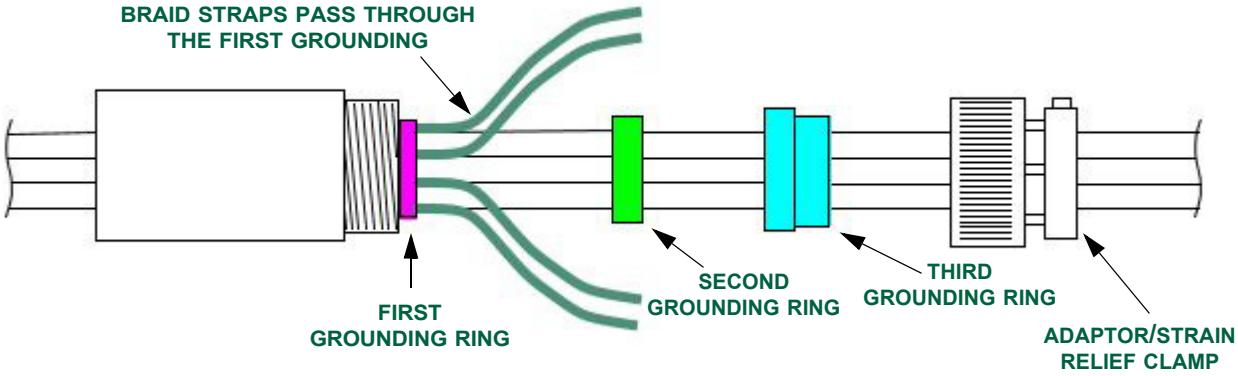
Step 3. Terminate each of the wires in the loom with crimp contacts according to PPS 9.19 (Automatic Crimping of Size 16 - 22 Electrical Contacts) or PPS 9.36 (Manual Crimping of Size 12 - 22 Contacts).

Step 4. Assemble the crimp contacts to the connector according to PPS 9.22.

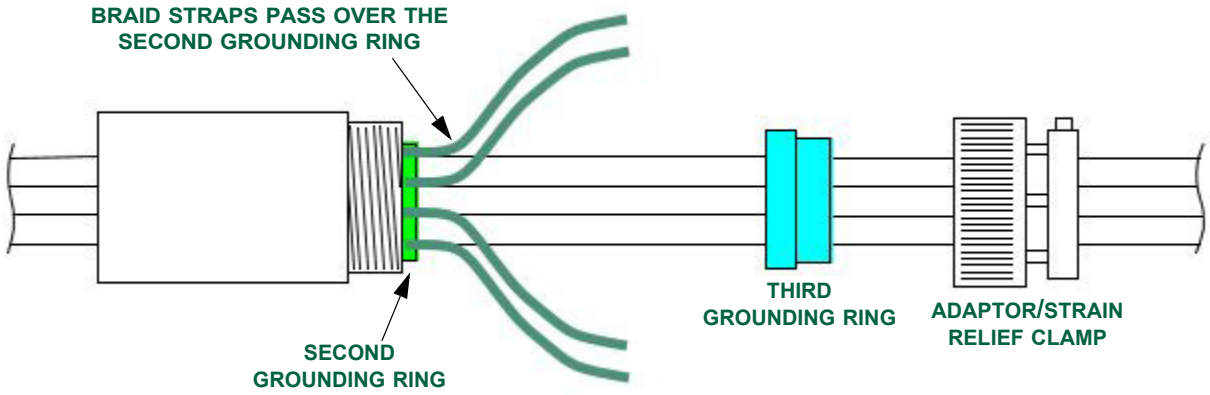
Step 5. Fold the braid straps back so that they are flush with the wire loom.

Step 6. Tighten the backshell securely in place.

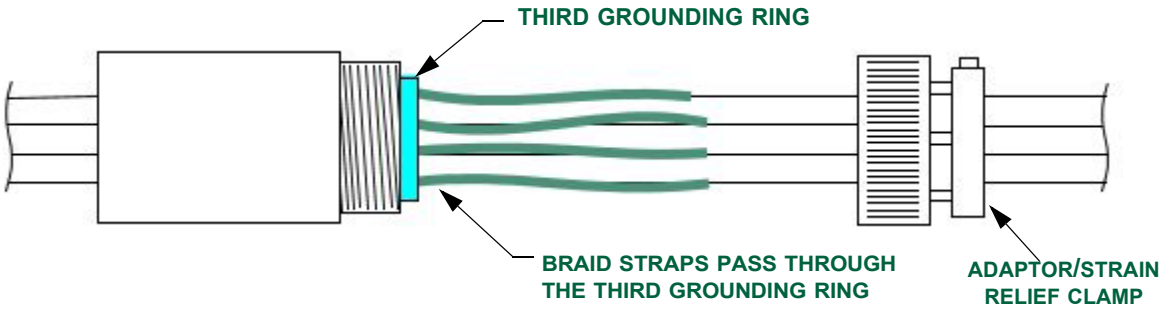
Step 7. Slip the first grounding ring forward over the braid straps into place at the rear of the backshell and fan out the braid straps as shown in the following figure.



Step 8. Slide the second grounding ring forward into position over the first ground ring at the rear of the connector so that the braid straps bend back over the first grounding ring and are caught between the first and second rings as shown in the following figure.



Step 9. Fold the braid straps back flush with the wire loom and slide the third grounding ring forward into position over the second ground ring at the rear of the connector with the braid straps caught between the second and third rings as shown in the following figure.

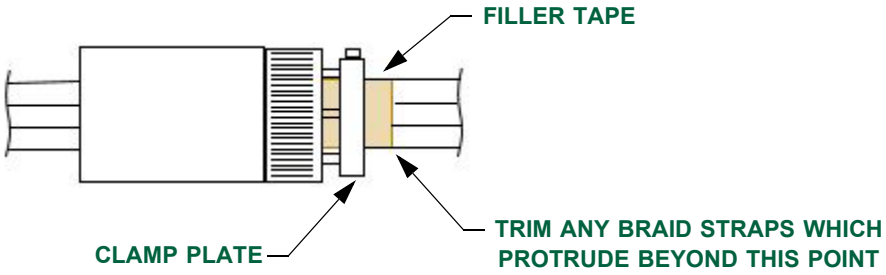


Step 10. Tuck the braid straps in between the wires of the wire loom so that they do not catch on the adaptor/strain relief clamp. If necessary, a tie wrap can be used to hold the straps in place while positioning the adaptor/strain relief clamp.

Step 11. Slide the adaptor/strain relief clamp over the shield termination module. If there are a lot of wires in the wire loom, it may be necessary to manipulate the wires while sliding the strain relief clamp into place. Ensure that the individual wire shields extend beneath the adaptor/strain relief clamp when in its final position.

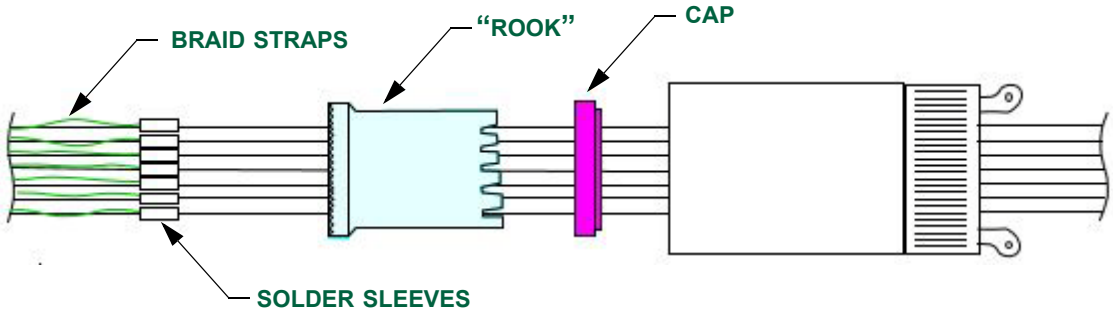
Step 12. Secure the adaptor/strain relief clamp according to section 5.10.

Step 13. Tighten the strain relief clamp around the wire loom. If necessary, wrap the wire loom with filler tape to ensure that the clamp has a secure grip on the loom. Trim any braid straps which are protruding from beyond the filler tape and remove the tie-wrap, if any, used to secure the braid straps (see the adjacent figure).



5.5.10 At Optilock Composite “Rook” backshells, terminate the individual wire shields of harnesses as follows:

Step 1. Terminate the braided shields of each individually shielded cable in the loom according to section 5.7 using solder sleeves with pre-installed braid straps. If the solder sleeve to be used is not specified by the engineering drawing, use the solder sleeve (with pre-installed braid strap) specified in Table II.



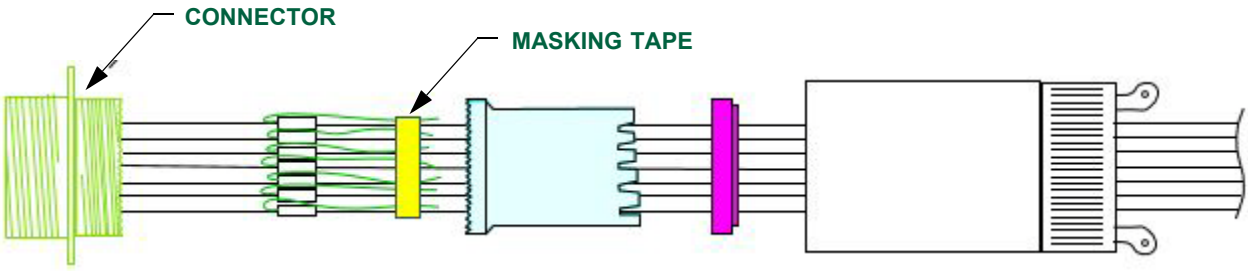
Step 2. Slide the backshell, cap and “rook” onto the wire loom. To facilitate this step it may be desirable to fold back the braided shields as shown beforehand.

Step 3. Terminate each of the wires in the loom 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).

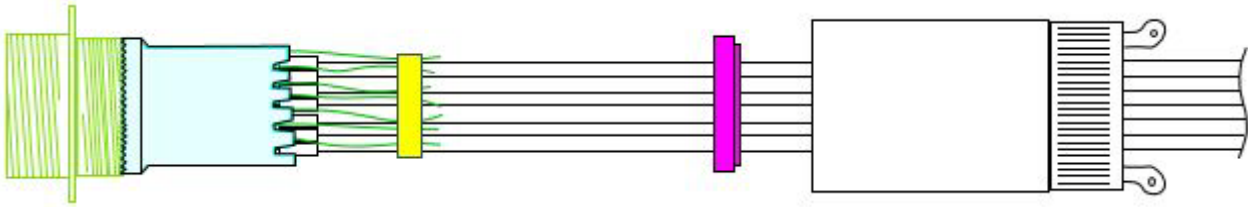
Step 4. Install the crimped contacts to the connector according to PPS 9.22.

Step 5. Space the braided shields out evenly, with minimized passage of the shields through the wire bundle (i.e., ensure that braided shields more towards one side of the bundle do not pass through to the other side of the bundle).

Step 6. Fold the braid straps back as shown in the following figure so that they lie flat against the wire loom and hold them temporarily in place with a piece of masking tape.

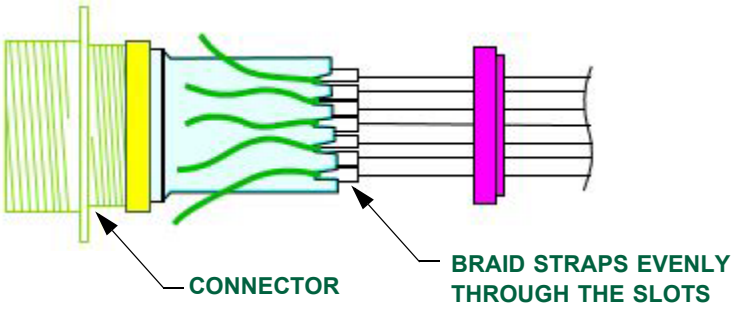


Step 7. Pass the “rook” over the wire loom and braided shields to mate with the connector as shown in the following figure.

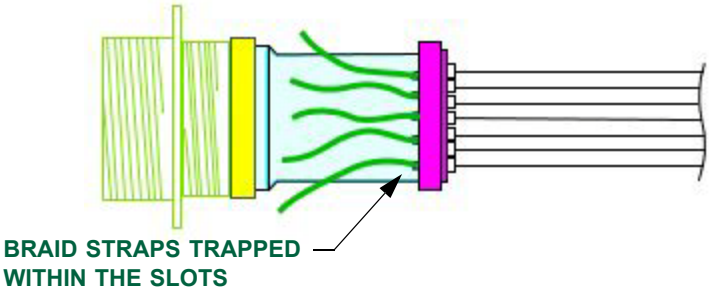


Step 8. Secure the “rook” in place temporarily with a piece of masking tape.

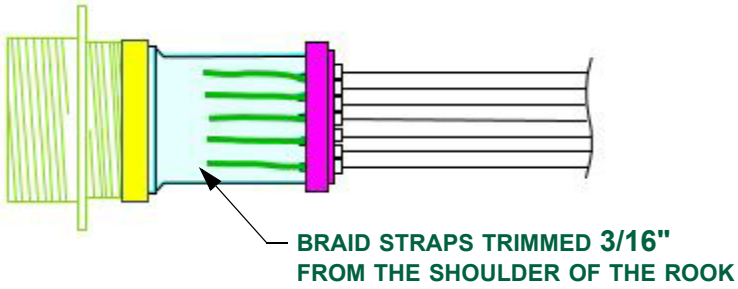
Step 9. Remove the masking tape temporarily holding the braided shields and distribute the braid shields evenly through the slots in the “rook” as shown.



Step 10. Slide the cap element onto the rear of the “rook” such that the two parts are fully engaged and the braided shields are trapped within the slots as shown.

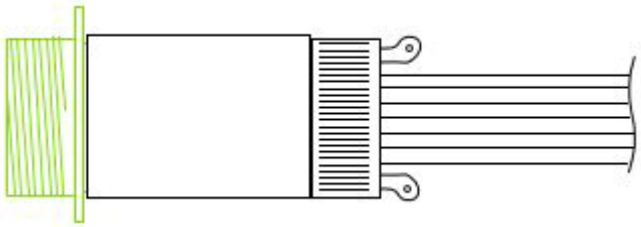


Step 11. Trim the braided shields so that they extend to approximately 3/16" from the shoulder of the "rook" as shown below:



Step 12. Remove the tape temporarily securing the “rook to the connector.

Step 13. Slide the backshell over the assembly (“rook” and cap) and thread the backshell onto the connector.



Step 14. Secure the backshell to the connector by torquing (and locking) according to section 5.10.

5.6 Disassembly of Connector Adaptors

5.6.1 Before removing the backshell from the connector, unlock the Opti-lock ring on the backshell. If the red coloured indicator is visible, the backshell is unlocked; if the blue coloured indicator is visible, the backshell is locked.

5.6.2 If it is necessary to disassemble braid straps from the shield termination module, carefully thread the braid straps through the shield termination module as the shield termination module is pulled back. Ensure that the braid straps are not ripped or damaged in the process.

5.7 Placement of Solder Sleeves

5.7.1 The placement of the solder sleeve is critical to proper shield termination; therefore, for each wire, strip the outer jacket back to expose the braided shield as specified herein, depending upon the adaptor, connector or splice involved.

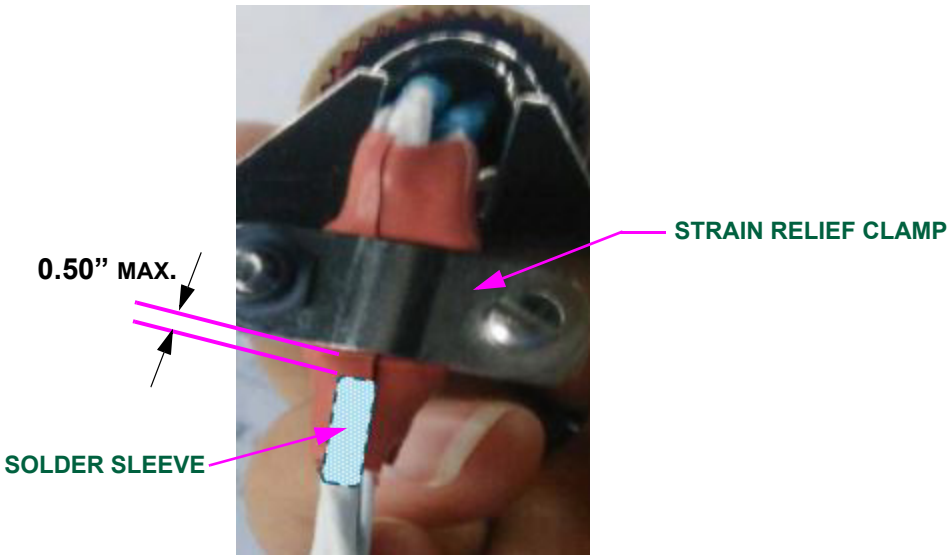
5.7.2 For the connectors listed in Table VI, it is imperative that the solder sleeves be positioned within the backshell; under no circumstances is it acceptable to position solder sleeves outside the backshell. To ensure positioning of the solder sleeve within the backshell, strip back the wire outer jacket 1 1/2".

5.7.2.1 For the connectors listed in Table VI, for solder sleeves within the backshell, minimize any contact with the edge of the connector backshell or surrounding structure/equipment where possible.

5.7.2.2 For the connectors listed in Table VI, for solder sleeves within the backshell, minimize any flexing or bending to the solder sleeve.

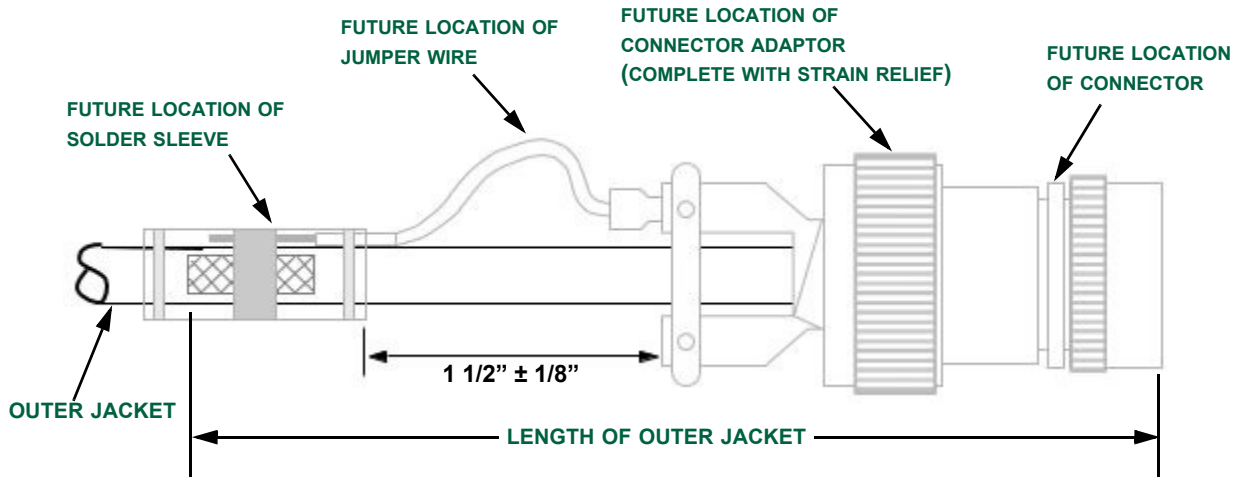
5.7.2.3 Solder sleeves must not be covered with tape or mounted under backshell saddle clamp.

5.7.3 For connectors with 3CGA, 3CFUGA or OL series Optilock backshells (**other than those listed in** Table VI) where it is not possible to include the solder sleeve(s) within the backshell, it is acceptable to adjust the initial strip length so that the solder sleeve will be positioned within 1/2” of the end of the backshell strain relief as shown below.



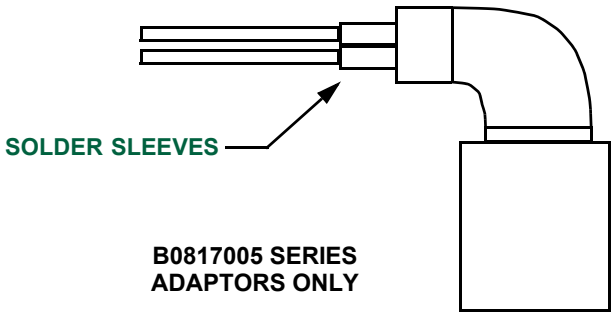
5.7.4 For Positronic D50000GVLO connectors, strip back the outer jacket such that the end of the solder sleeve will be no more than 1" from the end of the strain relief clamp as shown in Figure 5.

5.7.5 For M85049 and 3CSR series adaptors, determine the initial length of outer jacket to strip based on the requirements of the following figure:



M85049 and 3CSR Series Adaptors

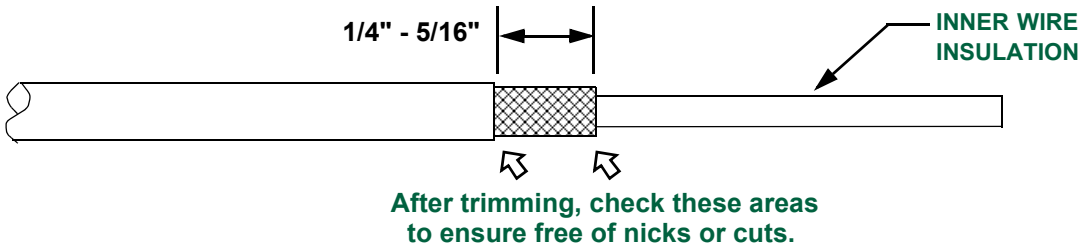
5.7.6 For B0817005 series adaptors, if possible, position solder sleeves within the adaptor by stripping back the wire outer jacket 1 1/2". Where it is not possible to include the solder sleeve(s) within the adaptor, it is acceptable to adjust the initial strip length (to a maximum of 3 1/2") so that the solder sleeve will be positioned immediately adjacent to the end of the adaptor with **no gap** as shown below.



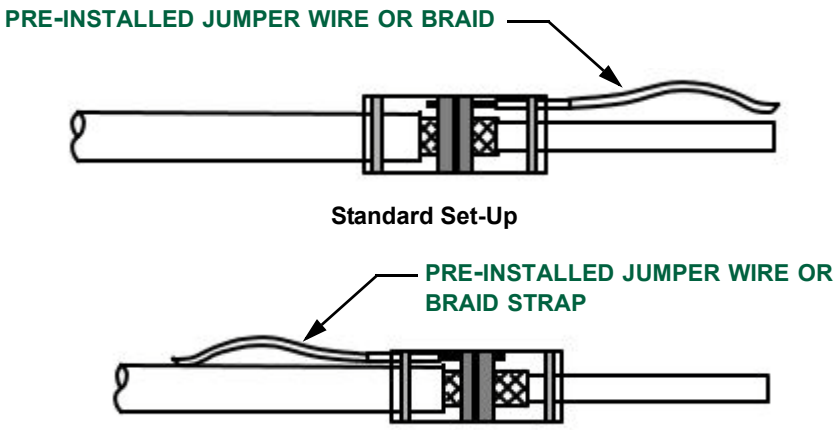
5.8 Installation of Solder Sleeves

5.8.1 Install solder sleeves as follows:

Step 1. Once the outer jacket has been stripped back the appropriate distance to expose the braided shield as specified in section 5.7, trim back the braided shield so that it protrudes 1/4" - 5/16" from the outer jacket as shown below.



Step 2. Position the solder sleeve over the exposed braided shield so as to centre the solder sleeve over the exposed braided shield as shown in the following figure.



Except as noted below, ensure that the pre-installed jumper wire (or braid strap) faces forward, toward the connector. For Souriau Pelican PEL1-ECF-3522 series Connector Kit and Positronic D50000GVLO connector terminations ensure the pre-installed jumper wire (or braid strap) faces backward, away from the connector.

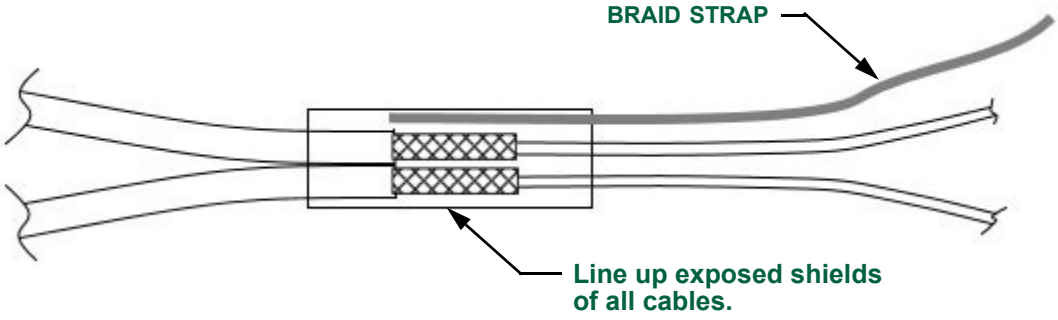
Step 3. Place the assembly into the centre of the reflector cut-out on the heating tool and activate the heating tool. Ensure the following:

- The stripped portion of the braided shield is confined between the meltable sealing inserts of the solder sleeve.
- If the sleeve is being installed on two cables, ensure that the pre-installed jumper wire (or braid strap) is located between the two shields.
- The jumper wire or braid strap is facing the heat source. This will cause the solder to flow toward the wire/strap.
- Do not move the wire during the heating process, this may cause a cold solder joint.
- Apply just enough heat to completely melt and flow the solder so as to form a fillet. Avoid overheating as this will cause the solder to "wick" along the shield braid leaving insufficient solder at the joint. If the specified solder sleeve has a thermal indicator in the form of a thin band of high temperature solder located in the middle of the solder ring (i.e., Raychem SO63 series), keep heating until the thin band of solder melts. If the solder does not flow properly, inform Methods or Engineering. **Do not** attempt to fix the problem by adding flux, etc. (adding flux may cause corrosion problems in the future).

Step 4. Allow the solder joint to cool sufficiently for the solder to solidify before disturbing the assembly.

5.8.2 For 3CSR and M85049 series adaptors only, if the engineering drawing specifies use of a grounding wire terminated with a contact instead of a terminal lug, cut the grounding wire to a length suitable for insertion of the contact in the connector without adjustment of the shielded wire strip length or final solder sleeve location relative to the adaptor.

5.8.3 In order to allow the shield termination module to slide over the solder sleeves during shield termination at Optilock backshells (3CGA, 3CFUGA and OL series) and D50000GVLO connectors, it is sometimes necessary to terminate two or more individual wire shields with a single solder sleeve as shown below:



5.8.3.1 Do not terminate the individual shields of two or more separate wires with a single solder sleeve unless the number of individual wire shields to be terminated exceeds the number in the following table:

SHELL SIZE	MAXIMUM NUMBER OF INDIVIDUAL WIRE SHIELDS WHICH CAN BE INDIVIDUALLY TERMINATED	
	BRAID SHIELDS	BRAID STRAPS
08 / 09 (A)	1	1
10 / 11 (B)	3	4
12 / 13 (C)	5	9
14 / 15 (D)	10	14
16 / 17 (E)	15	21
18 / 19 (F)	17	25
20 / 21 (G)	23	32
22 / 23 (H)	28	40
24 / 25 (J)	36	48

5.8.3.2 Do not terminate more than two wire shields with a single solder sleeve unless it is necessary for the shield termination module to fit over the assembly.

5.8.3.3 Do not terminate more than four individual wire shields with a single solder sleeve.

5.8.3.4 If multiple cables are to pass through a single solder sleeve, it is advisable to identify the individual conductors (e.g., with tape) before installing the solder sleeve. Once the sleeve is installed, it is sometimes difficult to determine which conductor is coming from each cable. This can result in the pins being installed in the wrong contact cavity. **Be sure to remove all tape after the crimped contacts have been assembled to the connector.**

5.8.3.5 If terminating two or more individual wire shields in a single solder sleeve, use the smallest possible solder sleeve which will fit over the group of wires.

5.8.3.6 Terminate the individual shields of two or more separate wires with a single solder sleeve only if **all** of the following conditions are met:

- The EMC code is the same for both wires (e.g., both wires carry a digital signal). The EMC code is the last digit in the wire identification code.
- The system code is the same for both wires (e.g., both wires service the same system on the plane). The system code is comprised of the first four digits in the wire identification code.
- The shields are being terminated at an Optilock backshell (3CGA, 3CFUGA or OL series) or a D50000GVLO connector.

5.9 Terminating Jumper Wires in Terminal Lugs

5.9.1 Provided that the following conditions are met, up to four jumper wires may be terminated in a single terminal lug. During the crimping operation, treat multiple jumpers which terminate in a single lug as if they were a single wire.

- The EMC code must be the same for all wires being grounded via a common terminal lug (e.g., all wires carry a digital signal). The EMC code is the last digit in the wire identification code.
- The system code must be the same for all wires being grounded via a common terminal lug (e.g., all wires service the same system on the plane). The system code is comprised of the first four digits in the wire identification code.
- The terminal lug must be capable of accommodating the combined circular mill area of the jumper wires.

5.9.2 Before installing the terminal lugs, trim each jumper wire to a total length of no more than 3".

5.9.3 For backshells with a shell size of between 8 and 16, use a terminal lug with a #6 stud size. For backshells with a shell size of 18 or larger, use a terminal lug with a #10 stud size.

5.9.4 Use as few terminal lugs as possible and distribute the wires as evenly as possible among the terminal lugs.

5.9.5 Unless otherwise specified on the engineering drawing, terminate the jumper wires with the terminal lugs specified in Table V according to PPS 9.01.

TABLE V - TERMINAL LUG GAUGES

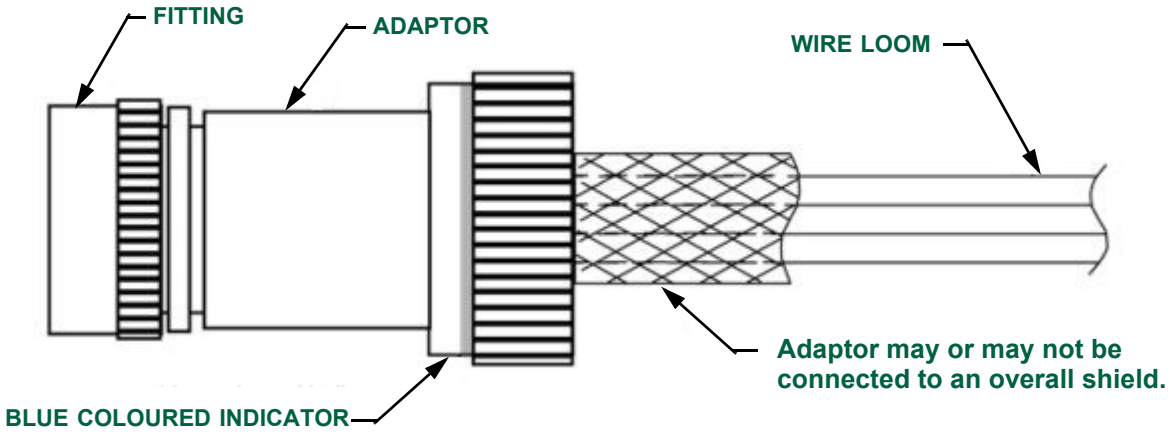
NUMBER OF AWG 22 WIRES BEING TERMINATED	TYPE OF UNINSULATED TERMINAL LUG	GAUGE OF TERMINAL LUG	FILLER WIRES REQUIRED
1 or 2	M7928/7	22 - 18	None
3	M7928/7	16 - 14	One 22 gauge wire
4	M7928/7	16 - 14	None

Note 1. If it is necessary to terminate 3 jumper wires in a single lug, crimp one 22 gauge filler wire along with the jumper wires according to PPS 9.09.

5.10 Securing Adaptors to Connectors, Transitions, and Bulkheads

5.10.1 Torque backshells/adaptors according to PPS 14.01 to the torque value specified therein.

5.10.2 For adaptors and backshells, after securing the adaptor or backshell to the connector, transition, or bulkhead, slide back the locking ring on the adaptor or backshell 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 or backshell until the locking ring can be slid into place. Do not loosen the adaptor or backshell.



5.11 Installation of Tinel-Lock Rings

5.11.1 Install Tinel-Lock rings as follows:

Step 1. Position the spacer between the Tinel-Lock ring and the shoulder of the adaptor.

Step 2. Position the Tinel-Lock ring so that it is close to the spacer **without** contact.

Step 3. Clamp the shield termination ring (Tinel-Lock ring) between the jaws of the Tinel-Lock ring installation kit hand tool (ref. paragraph 4.2.10), making sure that at least one of the two thermochromatic paint patches (blue or green) is visible (both preferably). Position the jaws on the Tinel-Lock ring and/or rotate the Tinel-Lock ring so that the thermochromatic paint patches are approximately in the middle between the upper and lower jaws. If using an unmodified hand tool, do not allow the jaws to touch the spacer, shield, or any surface other than the termination ring. In areas where close proximity of surrounding parts and/or structure make use of the unmodified hand tool difficult or impossible without contact with a surface other than the ring, use the Cantwell Cullen 3CFU-TIMHT-XXX tool kit which includes a hand tool (3CFU-TIMHT-01) which has been modified to include thin (1/64" thick) non-conductive insulative plates on the hand tool jaws (see Figure 6).

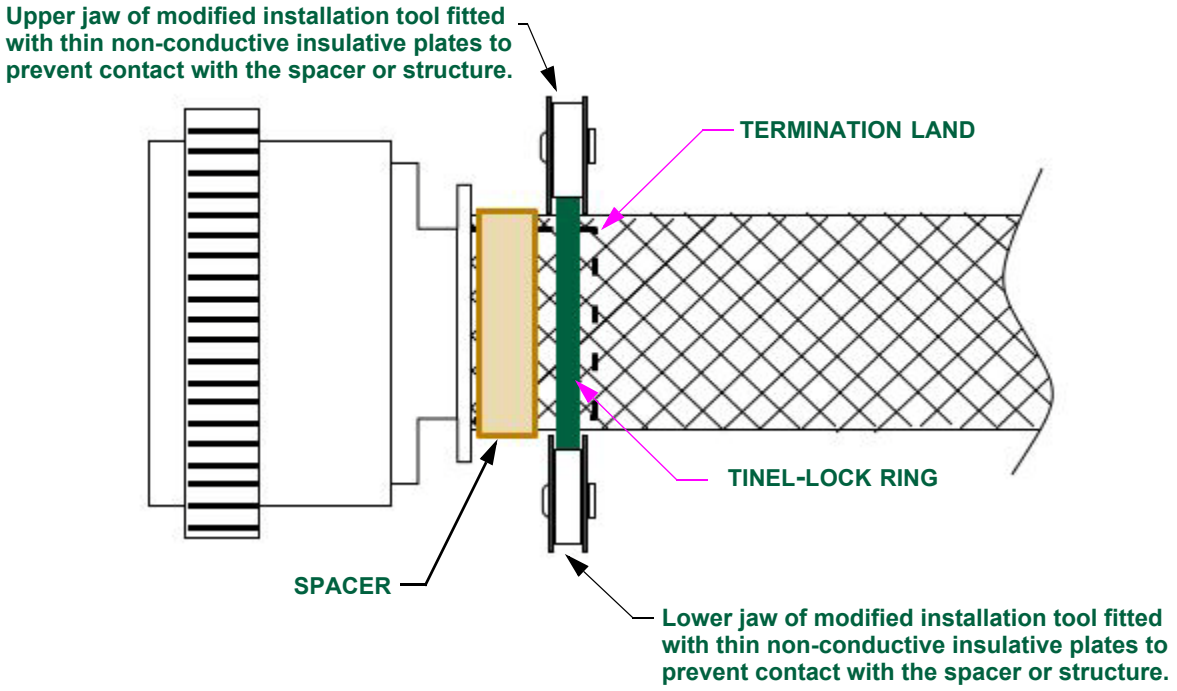


FIGURE 6 - INSTALLATION OF TINEL-LOCK RING USING A MODIFIED INSTALLATION TOOL

Step 4. Based upon past experience, adjust the tool base control so that the total heating time will take approximately 5 - 10 seconds.

Step 5. Depress the foot switch on the resistance installation tool to install (heat) the ring and continue to depress the foot switch until the patches of thermochromatic paint change to black (from blue or green); some smoking of the thermochromatic paint may occur and this is normal. If the heating time is consistently not between approximately 5 and 10 seconds, or if the thermochromatic paint patches fail to change to black, submit the equipment for servicing and/or refer to Liaison Engineering.

Step 6. Allow the assembly to cool.

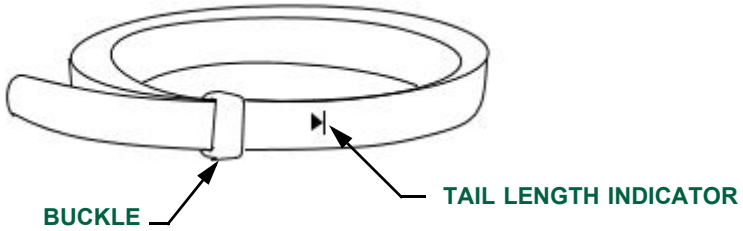
5.11.2 Remove installed Tinel-Lock rings according to PPS 9.45, if necessary, for rework or repair of an overbraid shielded harness.

5.12 Installation of Band Clamps

5.12.1 Install band clamps as follows:

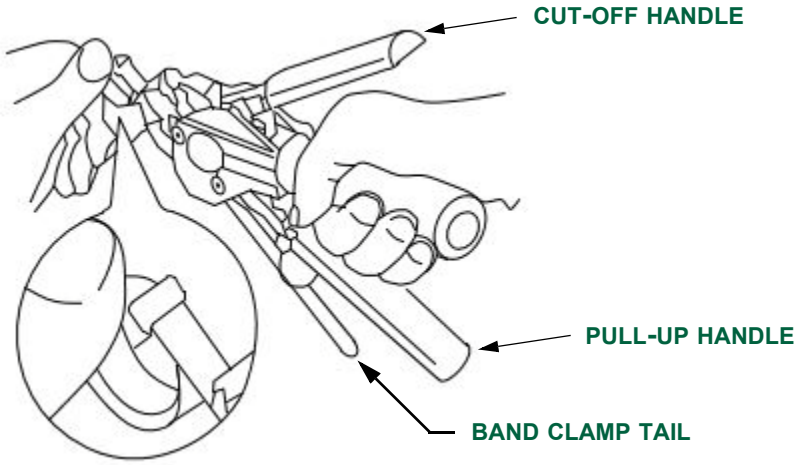
Step 1. When securing overbraid, “milk” the overbraid (i.e., grip and run hands along the braid) to remove slack and ensure a snug fit before installing band clamps.

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



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. paragraph 4.2.8) 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 and squeeze the blue 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 white cut-off handle.

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

6 REQUIREMENTS

6.1 Neither the fitting nor the adaptor shall have been deformed during the installation process.

6.2 Ensure that anti-rotation teeth are locked in place, as applicable.

6.3 Overbraid shields, convoluted tubing, and individual wire shields must be terminated as specified in section 5.5.

6.4 The inner convoluted tubing of overall shields must not be deformed at the adaptors.

6.5 The cable assembly must pass all electrical bonding tests as specified by PPS 9.06. The tests are required to verify that individual and/or overall shields (as required by the engineering drawing) are properly bonded to the adaptors in order to maintain effective cable shielding.

6.6 Check all wire insulation, braided shields and outer jackets for damage before termination.

6.7 Ground or jumper wires must be of sufficient length to allow for two service replacements while maintaining the minimum bend radius.

6.8 There must be no evidence of looseness of any terminating hardware.

6.9 The terminating hardware must not be deformed.

6.10 All individual wire shields must terminate within the backshell.

6.11 Only Teflon tape (ref. paragraph 4.1.2) shall have been used on conductive surfaces. Ensure that all tape is removed from conductive surfaces before completion of the assembly. Teflon tape used to secure braid straps to the wire loom when terminating individual wire shields at Optilock backshells (3CGA, 3CFUGA or OL series) which is covered with an overall overbraid shield does not have to be removed.

6.12 The backshell/adaptor must have been torqued onto the connector, transition, or bulkhead to the appropriate torque value according to PPS 14.01.

6.13 Ensure overbraid shields and individual wire shields are uniform, continuous and free of damage.

7 DHC SAFETY PRECAUTIONS

7.1 The safety precautions specified herein are specific to DHC to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is strongly 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 standard plant safety precautions when performing the procedure specified herein.

7.3 Hot air guns used can develop temperatures of up to 500°F (260°C) at the screen nozzle. Exercise caution during handling to avoid burns.

7.4 It is recommended to use hot air guns which include a power interrupt reset feature which will prevent an unattended heat gun from resuming heat (e.g., after a power failure); for hot air guns which are not equipped with a power interrupt reset feature, take care to ensure turning the gun off immediately in the event of a power interruption.

8 PERSONNEL REQUIREMENTS

8.1 This PPS has been categorized as a Controlled Special Process according to PPS 13.39. Refer to PPS 13.39 for personnel requirements.

TABLE VI - CONNECTORS MOUNTED ON Q400 CRITICAL EQUIPMENT (SEE NOTE 1)

CONNECTOR IDENTIFICATION	HARNESS ASSEMBLY	AIRCRAFT LOCATION
2200-P1A-A1	89812001	Cockpit To Fuse Interface
2200-P1A-A2	89812001	Cockpit To Fuse Interface
2200-P1C-A1	89812001	Cockpit To Fuse Interface
2200-P1C-A2	89812001	Cockpit To Fuse Interface
2210-P1-A3	83910505	LH Cockpit, Upper
2210-P2-A3	83910506	RH Cockpit, Upper
2212-P1-A1	83910502	RH Cockpit, Lower
2320-P1-A3	83910501	LH Cockpit, Lower
2320-P1B-A1	89812001	Cockpit To Fuse Interface
2320-P1C-A1	89812001	Cockpit To Fuse Interface
2700-P1	82420232	CTR LH Bottom
2700-P100	83910501	LH Cockpit, Lower
2700-P2	82420281	CTR RH Bottom
2710-P1-A2	83910501	LH Cockpit, Lower
2730-P1-A3	83910505	LH Cockpit, Upper
2730-P1-A4	83910506	RH Cockpit, Upper
2730-P1A-A1	89812001	Cockpit To Fuse Interface
2730-P1A-A2	89812001	Cockpit To Fuse Interface
2730-P1C-A1	89812001	Cockpit To Fuse Interface
2730-P1C-A2	89812001	Cockpit To Fuse Interface
2752-P1	82420232	CTR LH Bottom
2752-P2	82420281	CTR RH Bottom
3140-P1A-A1	89812001	Cockpit To Fuse Interface
3140-P1A-A2	89812001	Cockpit To Fuse Interface
3140-P1C-A1	89812001	Cockpit To Fuse Interface
3140-P1C-A2	89812001	Cockpit To Fuse Interface
3141-P1A-A1	89812001	Cockpit To Fuse Interface
3141-P1A-A2	89812001	Cockpit To Fuse Interface
3141-P1C-A1	89812001	Cockpit To Fuse Interface
3141-P1C-A2	89812001	Cockpit To Fuse Interface

TABLE VI - CONNECTORS MOUNTED ON Q400 CRITICAL EQUIPMENT (SEE NOTE 1)

CONNECTOR IDENTIFICATION	HARNESS ASSEMBLY	AIRCRAFT LOCATION
3251-P1	82410700	Nose
3261-P1A	89812001	Cockpit To Fuse Interface
3261-P1B	89812001	Cockpit To Fuse Interface
3261-P1C	89812001	Cockpit To Fuse Interface
3412-P1-A1	83910505	LH Cockpit, Upper
3412-P1-A2	83910506	RH Cockpit, Upper
3412-P1-A3	83910505	LH Cockpit, Upper
3412-P1-A4	83910505	LH Cockpit, Upper
3420-P1-A1	82420232	CTR LH Bottom
3420-P1-A2	82420281	CTR RH Bottom
3420-P1-A5	83910501	LH Cockpit, Lower
3420-P1-A6	83910502	RH Cockpit, Lower
3428-P1-A1	83910505	LH Cockpit, Upper
3428-P1-A2	83910505	LH Cockpit, Upper
3428-P1-A3	83910505	LH Cockpit, Upper
3428-P1-A4	83910505	LH Cockpit, Upper
3428-P1-A5	83910501	LH Cockpit, Lower
3428-P1-A6	83910502	RH Cockpit, Lower
3428-P2-A1	83910505	LH Cockpit, Upper
3428-P2-A2	83910505	LH Cockpit, Upper
3428-P2-A3	83910505	LH Cockpit, Upper
3428-P2-A4	83910505	LH Cockpit, Upper
3442-P1-A1	83910505	LH Cockpit, Upper
3442-P1-A2	83910505	LH Cockpit, Upper
3442-P1-A3	83910505	LH Cockpit, Upper
3442-P1-A4	83910505	LH Cockpit, Upper
7600-P1	83910505	LH Cockpit, Upper
7600-P100	83910506	RH Cockpit, Upper
7600-P101	83910506	RH Cockpit, Upper
7600-P102	83910502	RH Cockpit, Lower
7600-P103	83910501	LH Cockpit, Lower
7600-P2	83910501	LH Cockpit, Upper
7740-P1-A1	83910505	LH Cockpit, Upper
7740-P1-A2	83910505	LH Cockpit, Lower
7740-P2-A1	83910505	LH Cockpit, Upper

TABLE VI - CONNECTORS MOUNTED ON Q400 CRITICAL EQUIPMENT (SEE NOTE 1)

CONNECTOR IDENTIFICATION	HARNESS ASSEMBLY	AIRCRAFT LOCATION
9811-J1001	83910505	LH Cockpit, Upper
9811-J1002	83910505	LH Cockpit, Upper
9811-J1003	83910505	LH Cockpit, Upper
9811-J1004	83910505	LH Cockpit, Upper
9811-J1005	89812001	Cockpit To Fuse Interface
9811-J1007	83910505	LH Cockpit, Upper
9811-J1008	82420232	CTR LH Bottom
9811-J1009	83910505	LH Cockpit, Upper
9811-J1010	82420232	CTR LH Bottom
9811-J1011	82420232	CTR LH Bottom
9811-J1012	89812001	Cockpit To Fuse Interface
9811-J1013	83910505	LH Cockpit, Upper
9811-J1014	83910505	LH Cockpit, Upper
9811-J1015	83910505	LH Cockpit, Upper
9811-J1016	83910505	LH Cockpit, Upper
9811-J1018	83910505	LH Cockpit, Upper
9811-J1020	83910505	LH Cockpit, Upper
9811-J1021	83910505	LH Cockpit, Upper
9811-J1022	83910501	LH Cockpit, Lower
9811-J1023	83910501	LH Cockpit, Lower
9811-J1024	82420232	CTR LH Bottom
9811-J1025	83910501	LH Cockpit, Lower
9811-J1026	89812001	Cockpit To Fuse Interface
9811-J1027	89812001	Cockpit To Fuse Interface
9811-J2006	82420281	LH Cockpit, Lower
9811-J3005	89812001	Cockpit To Fuse Interface
9811-J3007	89812001	Cockpit To Fuse Interface
9811-J3008	82420232	CTR LH Bottom
9811-J3009	83910505 & 84900105	LH Cockpit, Upper
9811-J3010	82420232	CTR LH Bottom
9811-J3011	83910505	LH Cockpit, Upper
9811-J3012	83910505	LH Cockpit, Upper
9811-J4001	83910506 & 82321246	RH Cockpit, Upper
9811-J4003	82420281	CTR RH Bottom
9811-J4006	82420232	CTR LH Bottom

TABLE VI - CONNECTORS MOUNTED ON Q400 CRITICAL EQUIPMENT (SEE NOTE 1)

CONNECTOR IDENTIFICATION	HARNESS ASSEMBLY	AIRCRAFT LOCATION
9811-J4007	82420281	CTR RH Bottom
9811-J4009	83910506 & 84900106	RH Cockpit, Upper
9811-J4010	83910506	RH Cockpit, Upper
9811-J4011	82420281	CTR RH Bottom
9811-J5000	89812001	Cockpit To Fuse Interface
9811-J5001	89812001	Cockpit To Fuse Interface
9811-J5002	89812001	Cockpit To Fuse Interface
9811-J5003	89812001 & 82321242	Cockpit To Fuse Interface
9811-J5004	89812001	Cockpit To Fuse Interface
9811-J5005	89812001	Cockpit To Fuse Interface
9811-J5006	89812001	Cockpit To Fuse Interface
9811-J5007	89812001	Cockpit To Fuse Interface
9811-J5008	89812001	Cockpit To Fuse Interface
9811-J5009	89812001	Cockpit To Fuse Interface
9811-J5010	89812001	Cockpit To Fuse Interface
9811-J5011	89812001	Cockpit To Fuse Interface
9811-J5012	89812001	Cockpit To Fuse Interface
9811-RJB1-P1A	82420232	CTR LH Bottom
9811-RJB1-P1C	82420232	CTR LH Bottom
9811-RJB1-P1D	82420232	CTR LH Bottom
9811-RJB1-P1F	82420232	CTR LH Bottom
9811-RJB2-P1B	82420281	CTR RH Bottom

Note 1. Shield solder sleeve must be positioned inside these backshells.