BOMBARDIER Toronto (de Havilland) **PROPRIETARY INFORMATION**	**PPS 9.34** **PRODUCTION PROCESS STANDARD**

Terminating Electrical Shields

Issue 29
- This standard supersedes PPS 9.34, Issue 28.
- 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.

Approved By:		(Bruce Campbell)	Aug 17, 2017
	Materials Technology		
		(Michael Lightbody)	Sept 20 2017
	Quality		
Perpared By:		(Michael Wright)	August 15, 2017
	Core Methods - PPS		

Issue 29 - 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.

- Added inch equivalents to dimensions specified in millimetres for cable diameter when selecting Ideal cable strippers and/or replacement blade sets.

- Revised instructions for installation of ground and jumper wires to specify that unless otherwise specified by the engineering drawing, wiring list or PPS 9.39, ground or jumper wires shall be oriented directly towards termination (i.e., shall not loop back).

- Deleted general description of a solder sleeve intended to be installed using infrared heating tools. Use of such solder sleeves and tools is no longer referenced in this PPS.

- Added a general safety precaution indicating that the safety precautions specified in this PPS are specific to Bombardier Toronto (de Havilland) and that suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

Table of Contents

Sections **Page**

Table of Contents

Figures **Page**

Tables

1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for termination and splicing of braided electrical cable shields.

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 Specifications

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

3.2.2 PPS 9.04 - Assembly and Installation of Electrical and Electronic Wires and Cables.

3.2.3 PPS 9.07 - Soldering of Electrical Terminals.

3.2.4 PPS 9.09 - Splicing Electrical Wires.

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

3.2.6 PPS 9.24 - Wire and Cable Stripping.

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

3.2.8 PPS 9.39 - Installation and Termination of Braided Shields for EMI & HIRF Protection of Wire Harnesses on DASH 8 Series 400 Aircraft.

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

3.2.10 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 Splicing and terminating hardware, sleeves, jumper wires, etc. as specified on the engineering drawing or wiring list.

4.1.3 Heat shrinkable insulation sleeving, bulk length, to M23053/5 (flexible crosslinked polyolefin, white).

4.1.4 Heat shrinkable insulation sleeving, bulk length, to M23053/8 (semi-rigid crosslinked polyvinylidine fluoride - kynar, clear).

4.2 Equipment

4.2.1 Coaxial cable stripper (e.g., Ideal cable strippers as specified in the following table). Coaxial cable strippers must be capable of cleanly cutting the outer jacket of coaxial cables without damaging the braided shield.

Cable Diameter	Ideal Cable Stripper	Replacement Blade Set
up to 0.126" (3.2 mm)	45-162	L9225
0.126" - 0.217" (3.2 mm - 5.5 mm)	45-163	L9225
0.189" - 0.311" (4.8 mm - 7.9 mm)	45-164	L9225
0.252" - 0.563" (6.4 mm - 14.3 mm)	45-165	L9226

4.2.2 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.

4.2.3 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.

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

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

4.2.6 Crimping tools as specified in Table 4 and Table 5.

4.2.7 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. Refer to the following table for blade selection for the Ideal Ringer #45-404:

Cutting Depth	Ideal Blade Part Number	Cutting Depth	Ideal Blade Part Number
0.0030"	K-6491	0.0120"	K-6499
0.0044"	K-6492	0.0130"	K-6500
0.0060"	K-6493	0.0140"	K-6501
0.0070"	K-6494	0.0160"	K-6502
0.0080"	K-6495	0.0180"	K-6503
0.0090"	K-6496	0.0200"	K-6504
0.0100"	K-6497	0.0220"	K-6505
0.0110"	K-6498		

4.2.8 Hot air gun, complete with reflector (e.g., Steinel STEI-HG2310-BB). Hot air guns must be capable of heating a solder sleeve to the required temperature without over heating or damaging the solder sleeve 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).

5 Procedure

5.1 General

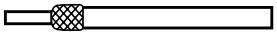
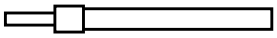
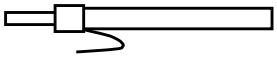
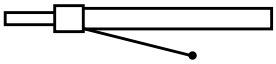
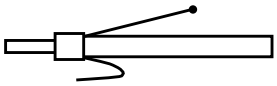
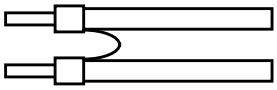
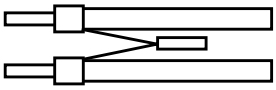
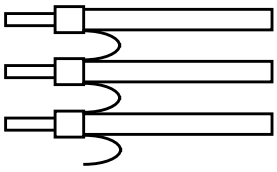
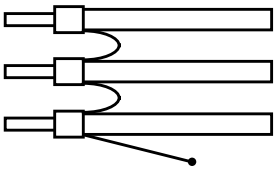
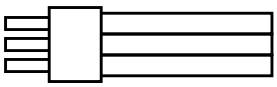
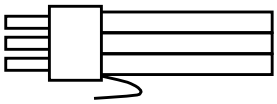
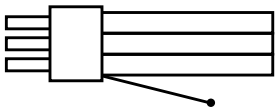
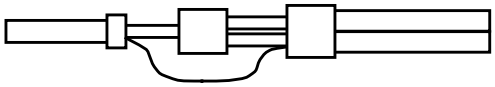
5.1.1 Refer to PPS 9.39 for positioning of solder sleeve terminations of individual wire shields at connector adapters on DASH 8 Series 400 aircraft for EMI and HIRF protection. For all other terminations, position solder sleeve shield terminations of individual wire shields as follows:

- For shields terminating at connectors which do not have a strain relief clamp, position shield terminations 1 1/8" - 4" from the rear of the connector insulation grommet.
- For shields which terminate at connectors which have a strain relief clamp, position shield terminations at least 1" from the end of the strain relief and no more than 4" from the rear of the connector insulation grommet.

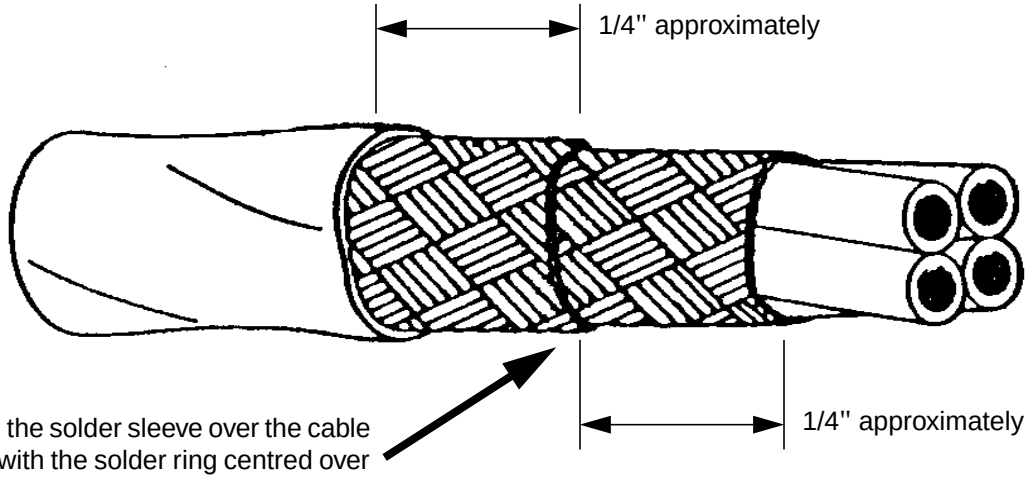
5.1.2 Check all wire insulation, braided shields and outer jackets for damage before termination.

5.1.3 Refer to Table 1 for typical termination configurations and type numbers. Refer to Figure 1, Figure 2 and Figure 3 for examples of special shield termination applications.

Table 1 - Typical Termination Configurations

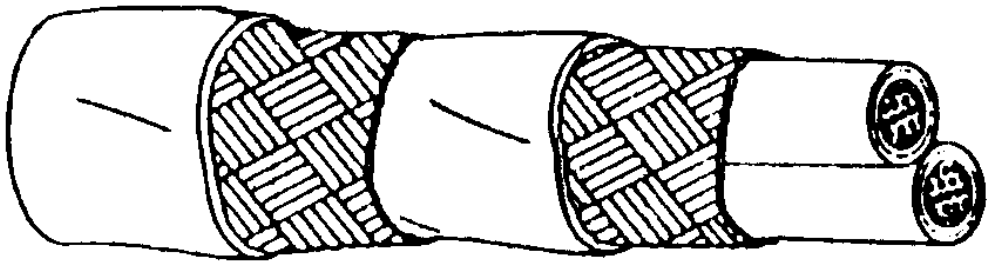
Type	Configuration	General Description	
		Standard	Alternate
1	floating shield		
2	single shield, no ground		
3	single shield, with ground		
4			
5	2 or more shields common, no ground		
6	2 or more shields common, with ground		
7	2 or more shields common, single ferrule, no ground		
8	2 or more shields common, single ferrule, with ground		
9	spliced shield		

Note 1. Unless otherwise specified on the engineering drawing or referencing PPS, jumpers and ground wires must loop back from the splice as shown above rather than proceeding directly from the sleeve or ferrule.



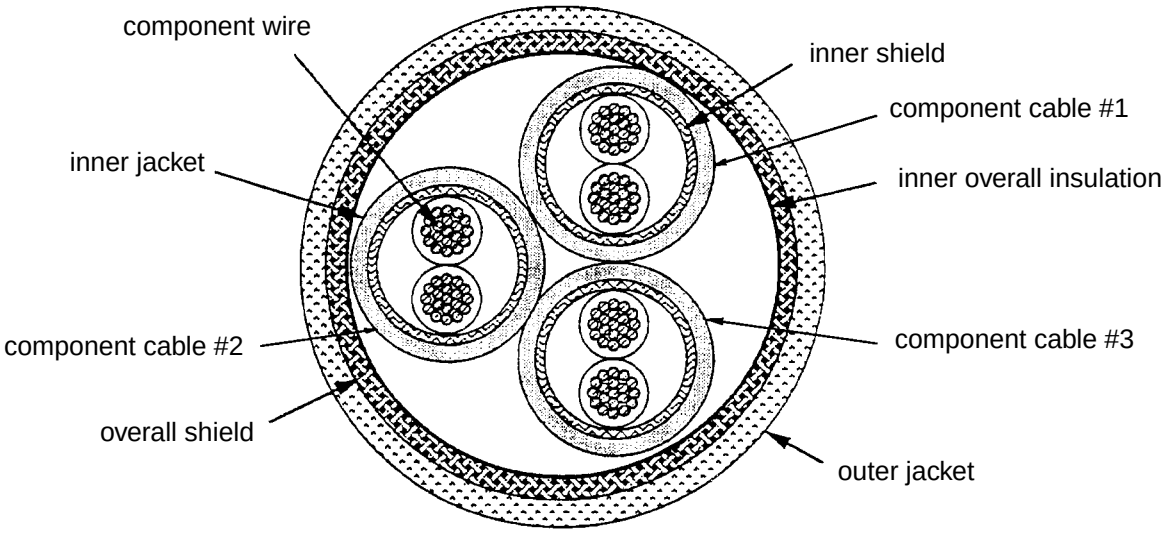
Position the solder sleeve over the cable shields with the solder ring centred over the point where the outer shield terminates and the inner shield begins to be exposed so that both shields will be soldered together and to the jumper or ground wire.

Figure 1 - Four Conductor, Double Shielded, Jacketed Cable



Terminate each shield (inner and outer) using a separate solder sleeve and jumper or ground wire.

Figure 2 - Two Conductor, Double Shielded, Double Jacketed Cable



Terminate each shielded pair with a separate solder shield and jumper or ground wire. Oversleeve the termination of the overall jackets (inner and outer) with heat shrinkable sleeve according to PPS 10.16.

Figure 3 - B0801457, 6 Conductor, Shielded Pairs, Jacketed Cable

5.1.4 Whenever using a hot air gun or heat gun (ref. para. 4.2.8) take care to ensure not to use too high a heat setting. The heat setting used must be appropriate to the task the hot air gun is being used for without causing damage to parts or surrounding structure. If necessary use heat guards to protect surrounding structure. If unsure what heat setting to use, start at a lower temperature setting and increase slowly to determine the proper setting.

5.1.5 Do not locate solder sleeves, HIRF splices or B-040-XX-N coaxial solder sleeve devices in positions where they may be clamped or subject to flexing or bending (may break if compressed or bent).

5.1.6 If possible, position solder sleeves, HIRF splices and B-040-XX-N coaxial solder sleeve devices in wire bundles so that they do not overlap. Solder sleeves and B-040-XX-N coaxial solder sleeve devices may overlap if necessary to maintain the proper distance from the connector as specified in para. 5.1.1. Stagger and locate solder sleeves, HIRF splices and B-040-XX-N coaxial solder sleeve devices on the outside of the cable group. As necessary, support the solder sleeves, HIRF splices and B-040-XX-N coaxial solder sleeve devices by installing a plastic cable tie according to PPS 9.04 on either side of the solder sleeves, HIRF splices or B-040-XX-N coaxial solder sleeve devices (avoid placing cable ties directly over solder sleeves, HIRF splices and B-040-XX-N coaxial solder sleeve devices).

5.2 Removal of Outer Jacket from Coaxial Cables and Shielded Cables

5.2.1 Remove the outer jacket from shielded cables as follows:

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

- For coaxial type cables, it is recommended that a coaxial cable stripper (ref. para. 4.2.1) 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 large or intermediate diameter, **round**, shielded cables or wires, it is recommended that a shielded cable stripper (ref. para. 4.2.7) 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. para. 4.2.2) is recommended.
- For smaller diameter shielded wires, use of hot tweezers (ref. para. 4.2.3) 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 (see Figure 4). 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 (see Figure 4). 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. para. 4.2.4) 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.

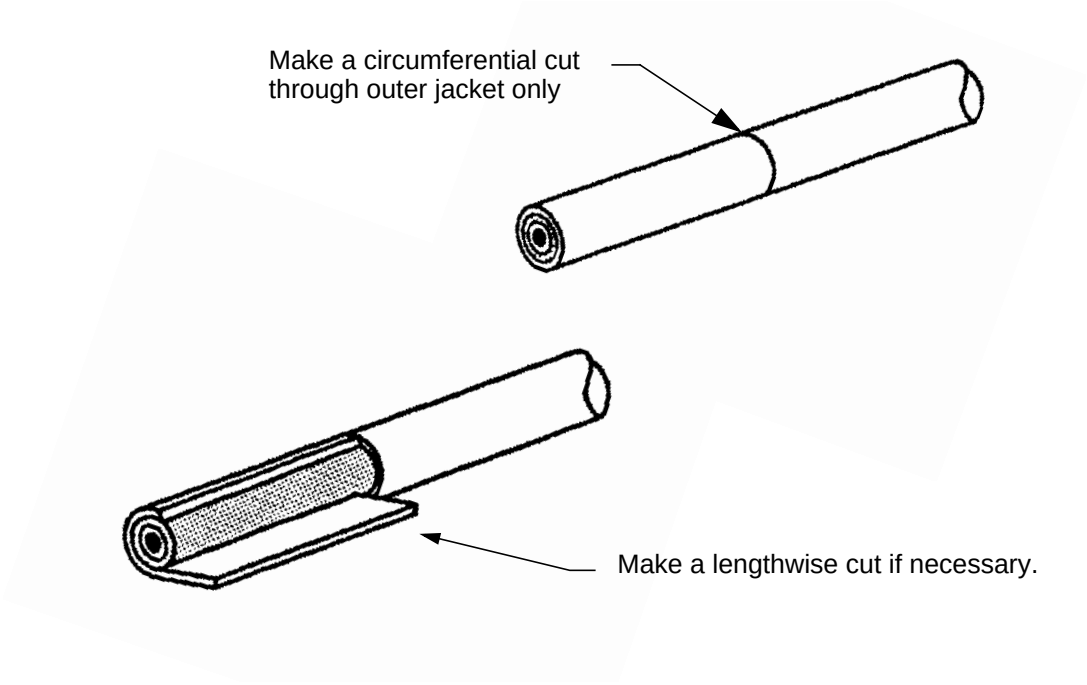


Figure 4 - Removal of Outer Jacket

5.3 Trimming Braided Shields

5.3.1 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 5). Take care to avoid nicking or damaging the conductor insulation while cutting the braided shield.

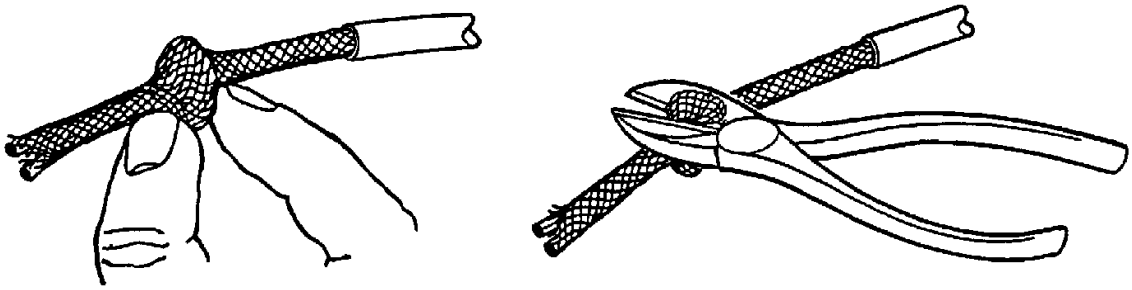


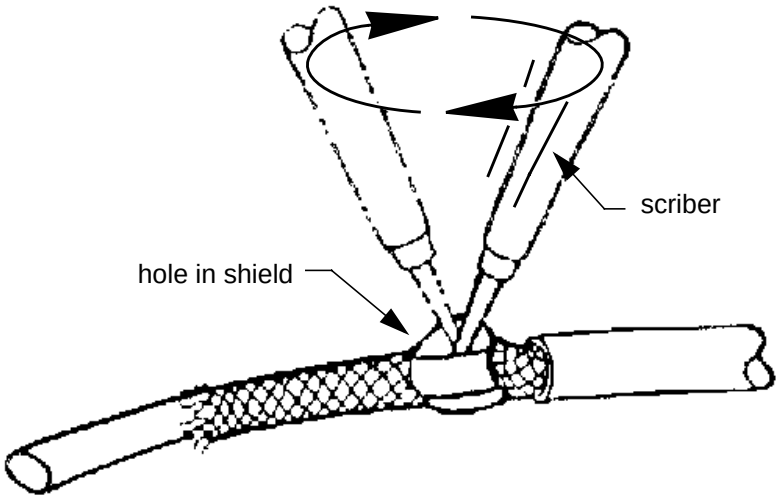
Figure 5 - Trimming Braided Shields

5.4 Forming Shield Pigtails

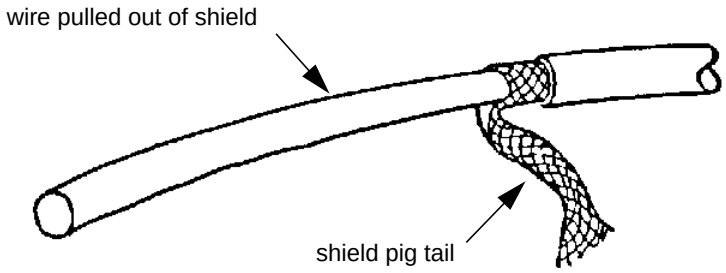
5.4.1 Form shield pigtails as follows:

Step 1. Loosen the braided shielding and push it back to form a bulge at the point necessary to obtain the correct length pigtail.

Step 2. Using a blunt scribing tool, open a hole in the braided shield at the bulge.



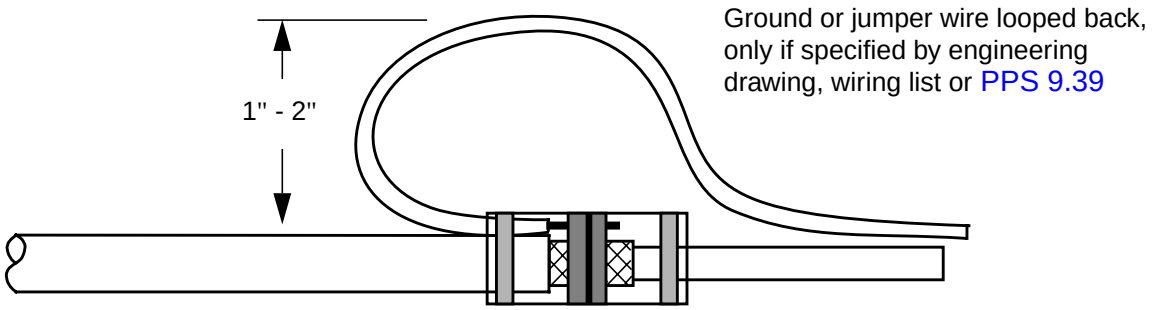
Step 3. Bend the wire at the hole and work the braided shield to allow the end of the wire to be pulled out of the braided shield.



5.5 Preparation of Ground and Jumper Wires

5.5.1 Unless otherwise specified by the engineering drawing or PPS, prepare ground and jumper wires as follows:

Step 1. Trim ground and jumper wires to allow for 2 service replacements. Where the engineering drawing, wiring list or PPS (e.g., PPS 9.39) specifies ground and jumper wires must loop back as shown below, also allow a 1" - 2" service loop to maintain the minimum bend radius.



Step 2. For ground and jumper wires to be used in ferrule type splices or terminations, strip the insulation from the end of the wire a distance approximately 1/16" longer than the length of the exposed wire shield to be included in the splice or termination. For ground and jumper wires to be used in solder sleeve type terminations, strip the insulation from the end of the jumper wire a distance equal to the length of the exposed wire shield. Strip the jumper wire insulation according to PPS 9.24.

Step 3. If specified on the engineering drawing or wiring list, install grounding lugs or contacts on the free end of the wires according to PPS 9.01, PPS 9.19 or PPS 9.36, as applicable.

5.5.2 If required, splice ground or jumper wires according to PPS 9.09.

5.5.3 The jumper wire must be compatible with the braided shield. If the specified jumper wire is incompatible, contact Methods or Engineering.

5.5.4 Tinning of ground or jumper wires which are to be used in ferrule type or solder sleeve type terminations is not required.

5.6 Terminating Shields using Solder Sleeves

5.6.1 Due to the heat involved during installation, use solder sleeves only on wires approved by Engineering for this procedure.

5.6.2 The sequence of steps specified in this section can be altered provided that the specified dimensions and requirements are maintained.

5.6.3 Refer to Table 2 for a listing of the shield type and solder sleeve size required for terminating shields of particular wires. Refer to Table 3 for the particular solder sleeve and ground lug (if any) to be used based on the shield type and solder sleeve size specified in Table 2. When installing a jumper between a silver/tin shield and a nickel shield, use a SO63 type solder sleeve with a **pre-installed** nickel jumper to terminate the silver/tin shield and a SO96 solder sleeve to terminate the nickel shield (**do not** attempt to use a regular SO63 solder sleeve with a separate nickel jumper).

Table 2 - Shield Type and Solder Sleeve Size Requirements

Wire Part Number	Shield Type	Solder Sleeve Size Required
55PC6000-22-0/9-9-9	silver/tin	3
B0801172-20	silver/tin	3
B0801175-16	silver/tin	2
B0801175-18	silver/tin	2
B0801175-20	silver/tin	1
B0801175-22	silver/tin	1
B0801402-12	silver/tin	4
B0801402-16	silver/tin	3
B0801402-20	silver/tin	3
B0801402-22	silver/tin	2
B0801403-12	silver/tin	5
B0801403-20	silver/tin	3
B0801403-22	silver/tin	3
B0801404-20	silver/tin	3
B0801404-22	silver/tin	3
B0801405-24	silver/tin	1
B0801406-24	silver/tin	2
B0801407-24	silver/tin	2
B0801408-24	silver/tin	3
B0801440-22	silver/tin	3
B0801457	nickel	5 + (3 x 3)
B0801463	nickel	4
M27500A16SM2N23	nickel	3
M27500A20SM1N23	nickel	2
M27500A20SM2N23	nickel	3
M27500A20SM4N23	nickel	3
M27500A24SN3N23	nickel	3

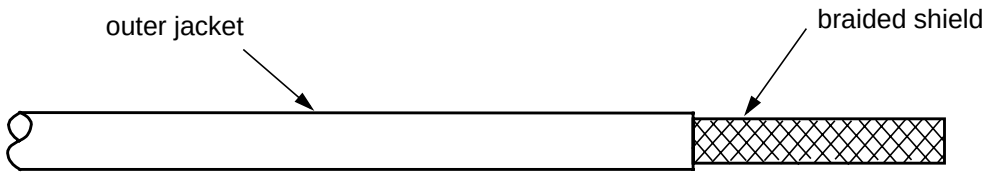
Note 1. Wire B0801457 is double shielded which requires 1 size 5 solder sleeve for the outside shield and 3 size 3 solder sleeves for the inner shields.

Table 3 - Solder Sleeve and Ground Lug/Contact Selection

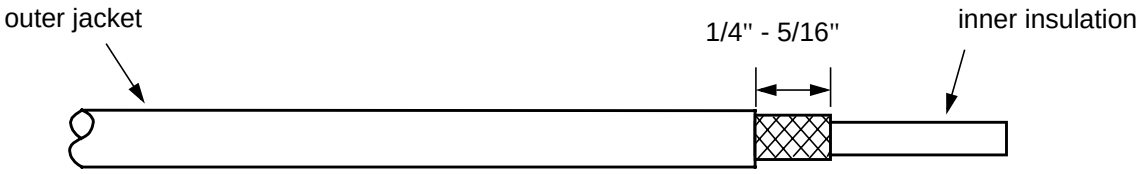
Solder Sleeve Size	Ground Termination	Lug	Solder Sleeve	
			For Nickel Shield Type Wires	For Silver/Tin Shield Type Wires
1	floating	n/a	B0816064-001 or SO96-1-00	B0816047-001 or SO63-1-00
	backshell ring	n/a	B0816062-001 or SO96-1-01	B0816063-001 or SO63-1-01
	contacts	n/a	B0816049-006 or SO96-1-55-22-95	B0816048-001 or SO63-1-55-22-5
	# 6 stud/screw	M7928/7-3		
	# 8 stud/screw	M7928/7-4		
	# 10 stud/screw	M7928/7-4		
2	floating	n/a	B0816064-002 or SO96-2-00	B0816047-002 or SO63-2-00
	backshell ring	n/a	B0816062-002 or SO96-2-01	B0816063-002 or SO63-2-01
	contacts	n/a	B0816049-007 or SO96-2-55-22-95	B0816048-002 or SO63-2-55-22-5
	# 6 stud/screw	M7928/7-3		
	# 8 stud/screw	M7928/7-4		
	# 10 stud/screw	M7928/7-4		
3	floating	n/a	B0816064-003 or SO96-3-00	B0816047-003 or SO63-3-00
	backshell ring	n/a	B0816062-003 or SO96-3-01	B0816063-003 or SO63-3-01
	contacts	n/a	B0816049-008 or SO96-3-55-22-95	B0816048-003 or SO63-3-55-22-5
	# 6 stud/screw	M7928/7-3		
	# 8 stud/screw	M7928/7-4		
	# 10 stud/screw	M7928/7-4		
4	floating	n/a	B0816064-004 or SO96-4-00	B0816047-004 or SO63-4-00
	backshell ring	n/a	B0816062-004 or SO96-4-01	B0816063-004 or SO63-4-01
	contacts	n/a	B0816049-009 or SO96-4-55-22-95	B0816048-004 or SO63-4-55-22-5
	# 6 stud/screw	M7928/7-3		
	# 8 stud/screw	M7928/7-4		
	# 10 stud/screw	M7928/7-4		
5	floating	n/a	B0816064-005 or SO96-5-00	B0816047-005 or SO63-5-00
	backshell ring	n/a	B0816062-005 or SO96-5-01	B0816063-005 or SO63-5-01
	contacts	n/a	B0816049-010 or SO96-5-55-22-95	B0816048-005 or SO63-5-55-22-5
	# 6 stud/screw	M7928/7-3		
	# 8 stud/screw	M7928/7-4		
	# 10 stud/screw	M7928/7-4		

5.6.4 Utilize the following procedure when terminating shields using solder sleeves:

Step 1. Strip the outer jacket to the required length according to section 5.2 as shown:

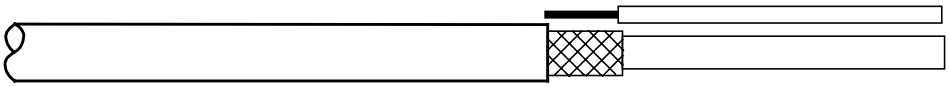


Step 2. Unless otherwise specified by the engineering drawing or PPS, trim back the braided shield to within 1/4" - 5/16" of the end of the outer jacket according to section 5.3 as shown below:

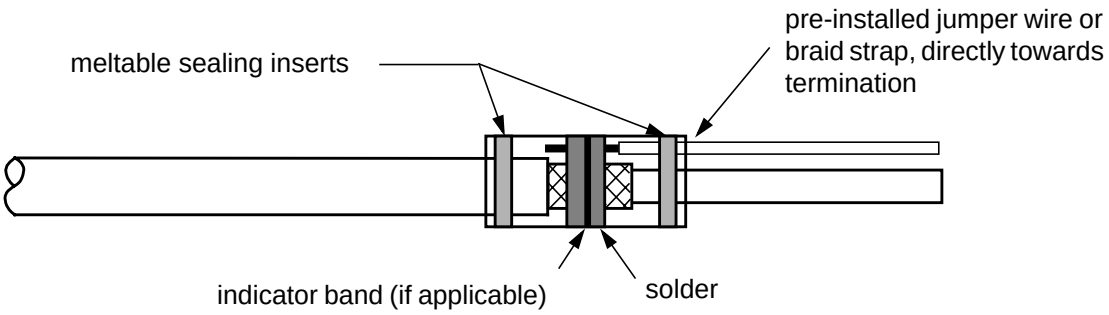


Step 3. Ensure that the exposed braid is completely free of insulation.

Step 4. When installing solder sleeves which are not equipped with pre-installed jumper or ground wires, position the stripped portion of the jumper or ground wire or the end of the strap over the stripped portion of the braided shield. Unless otherwise specified by the engineering drawing, wiring list, or PPS 9.39, orient the wire or strap directly towards termination as shown below.



Step 5. Assemble the solder sleeve specified on the engineering drawing, wiring list, or PPS onto the wires so as to centre the stripped portion of both conductors in the solder sleeve. Ensure that the braided shield and the jumper or ground wire strands are straight and flat. Bent or displaced wire strands may puncture the encapsulating sleeve during the soldering operation. Unless otherwise specified by the engineering drawing, wiring list or PPS 9.39), orient the pre-installed jumper wire or braid strap directly towards termination as shown in the following figure.



Step 6. Place the assembly into the centre of the reflector cut-out on the heating tool and activate the heating tool. Ensure that:

- The stripped portion of the braided shield is confined between the meltable sealing inserts of the solder sleeve.
- The jumper wire or braid strap is facing the heat source. This will cause the solder to flow toward the wire/strap.
- 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.
- 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 (e.g., 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 7. Allow the solder joint to cool sufficiently for the solder to solidify before disturbing the assembly.

5.6.5 If necessary, replace solder sleeves as follows:

Step 1. Score the sleeve using a sharp blade. It is not necessary to cut through the sleeve. Take care not to cut the cable jacket or jumper wire insulation.

Step 2. Reheat the sleeve until it softens and grasp it with a pair of needle-nose pliers on the side opposite the score line.

Step 3. Gently pull the sleeve off the assembly.

Step 4. Heat the solder joint until the solder melts and carefully separate any jumper wires or braid straps from the braid.

Step 5. Use a vacuum de-soldering tool to remove as much solder as possible from the braided shield.

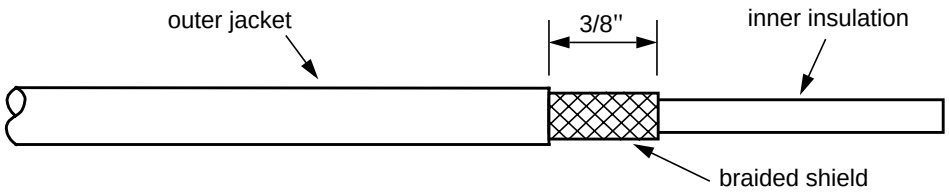
Step 6. Install a new solder sleeve as specified herein.

5.7 Floating Shield Terminations

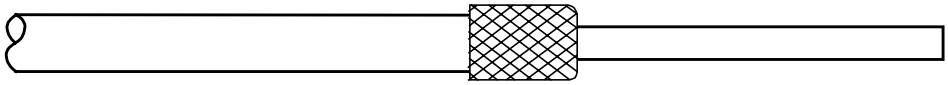
5.7.1 Terminate shields using floating shield terminations as follows:

Step 1. Strip the outer jacket to the required length according to section 5.2.

Step 2. Trim the braided shield according to section 5.3 so that it protrudes approximately 3/8" as shown:



Step 3. Fold the braided shield back over the outer jacket.



Step 4. Install a 1" to 2" length of white heat shrinkable sleeving over the floating shield according to PPS 10.16. Position the sleeve so that it is centred over the shield.

5.8 Splicing of Cable Shields

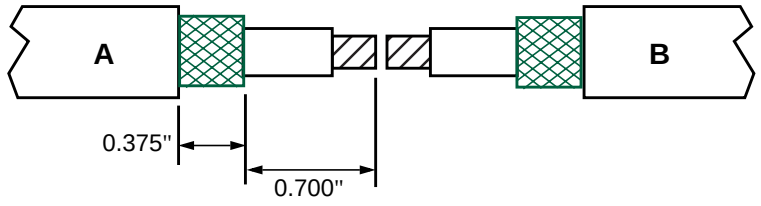
5.8.1 General

5.8.1.1 Splice cable shields using the method specified on the engineering drawing, wiring list, or PPS. Install flexible shield interconnect splices according to section 5.8.3. Install rigid shield interconnect splices (Raychem D-150 splice kits) according to section 5.8.2. If a splicing method is not specified, splice the shields using a jumper wire according to section 5.8.4.

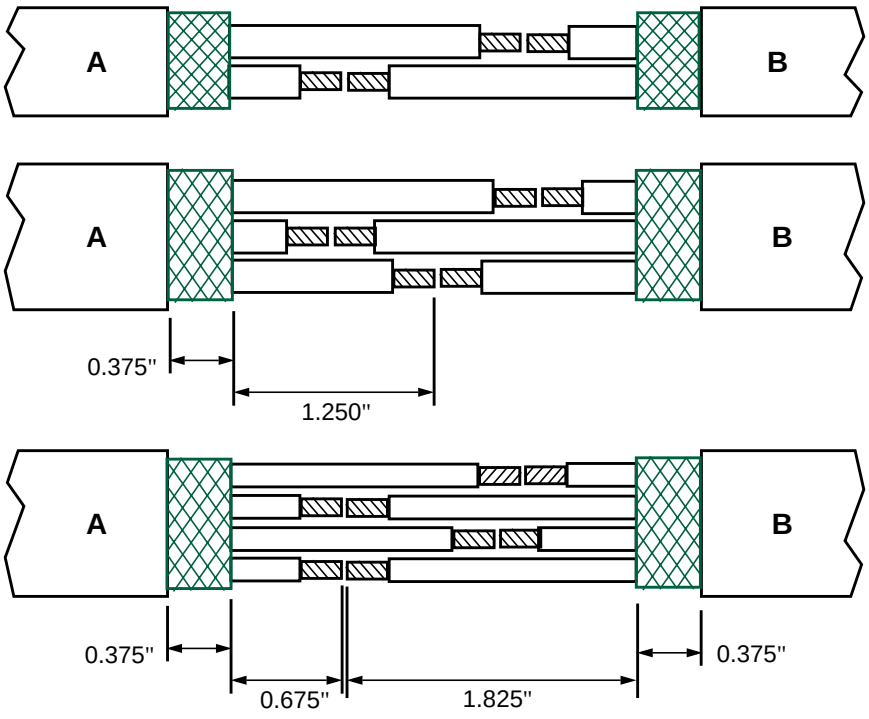
5.8.2 Installation of Rigid Shield Interconnect Splices (Solder Shield Type "HIRF" Splice)

5.8.2.1 Install the rigid shield interconnect splices as follows:

Step 1. Trim the outer jacket and braided shield as shown below. It is acceptable for there to be some variation in the lead lengths provided that the overall length of the installation is maintained so that the braided portion of the shield interconnect splice will contact the cable shields properly, and the overall lengths of spliced wires are approximately the same so that they do not bulge outwards.



For single conductor shielded cable, prepare both sides of cable assembly as shown (Dimensions for wire B equal those for wire A).



Measurements of Short Lead

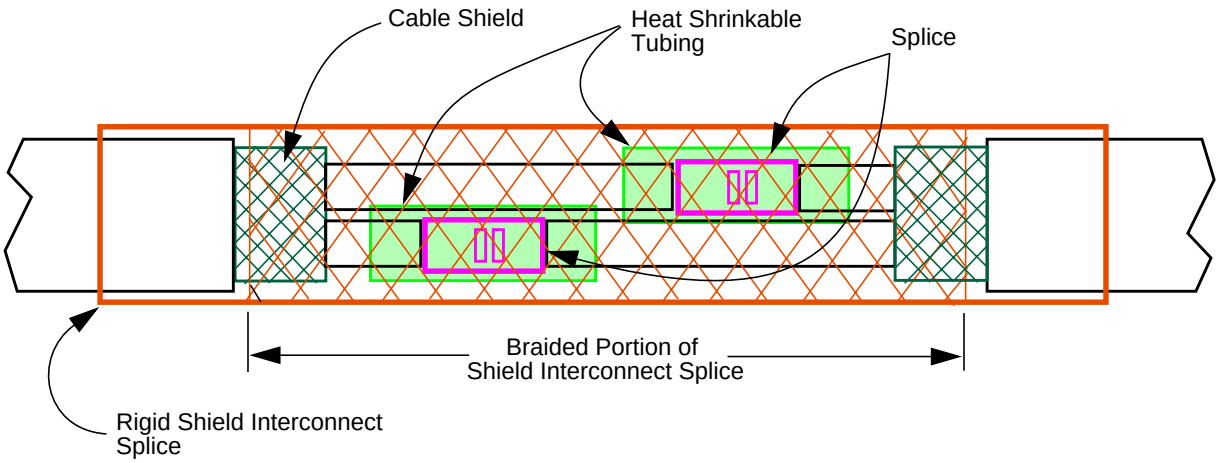
Measurements of Long Lead

For conductors with two, three, or four shielded cables, prepare long, short and median leads as shown.

Step 2. Slide all of the shield interconnect splicing hardware over the cables.

Step 3. Splice and insulate the individual conductor wires according to PPS 9.09.

Step 4. Centre the shield interconnect splice over the wire splices and the exposed cable shields as shown below. Ensure that the overall lengths of all spliced wires are approximately equal between the cable shields so that none of the splices or wires bulge out.



Step 5. Use a hot air gun to apply heat to the centre of the sleeve until the solder melts and the tube shrinks. If there are more conductors on one side of the splice than the other (e.g., splicing one conductor to two conductors) start heating the sleeve at the end with more wires.

Step 6. Move the heat toward one end of the solder shield slowly enough to shrink the tube. Ensure that the braided portion of the splice overlaps the cable shield and the gap, if any, between the end of the braided portion of the splice and the end of the outer jacket does not exceed 1/32" (it is acceptable for the braided portion of the splice to extend over the outer jacket).

Step 7. Apply heat for an additional 5 to 10 seconds to the final 1/2" of the braided portion of the solder shield to ensure that a sufficiently strong solder connection is made to the cable shield.

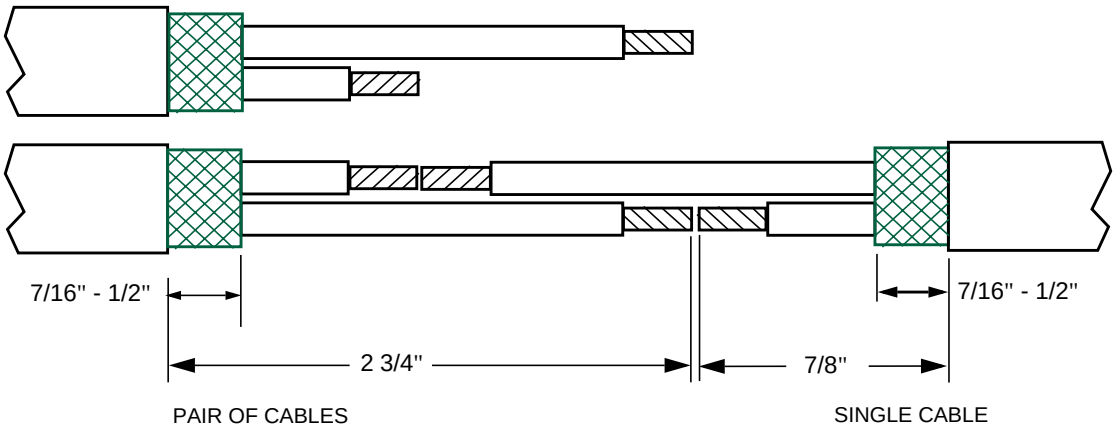
Step 8. Use a hot air gun to apply heat to the end of the sleeve until the adhesive melts and bonds to the outer cable jacket.

Step 9. If you started heating from the centre of the splice, repeat Step 6 through Step 8 for the other side of the rigid shield interconnect splice.

5.8.3 Installation of Flexible Shield Interconnect Splices (Solder Shield Type)

5.8.3.1 Install flexible shield interconnect splices as follows:

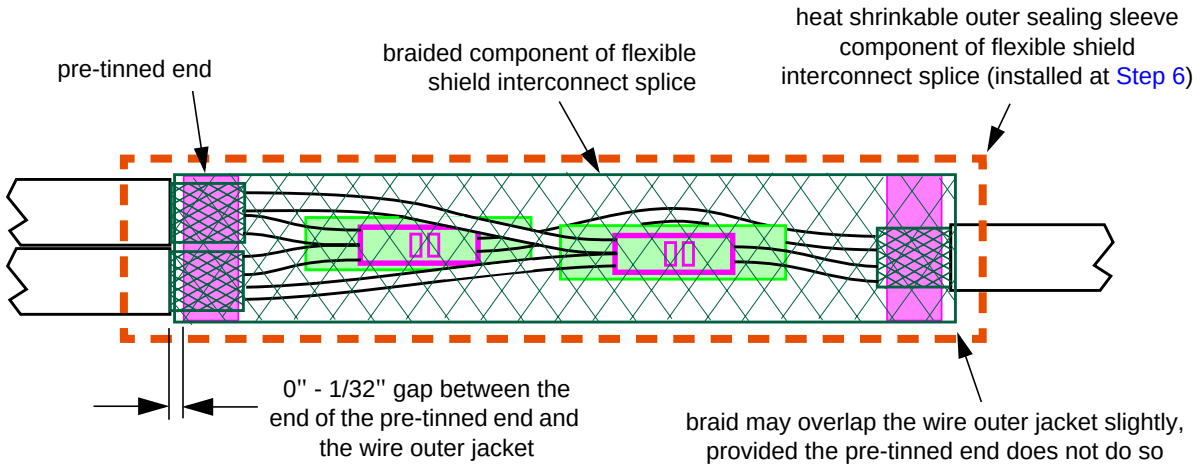
Step 1. Trim the outer jacket and braided shield as shown below. It is acceptable for there to be some variation in the lead lengths provided that the overall length of the installation is maintained so that the pre-tinned ends of the braid component of the shield interconnect splice will contact the cable shields properly and the overall lengths of spliced wires are approximately the same so that they do not bulge outwards.



Step 2. Slide all of the shield interconnect splicing hardware over the cables.

Step 3. Splice and insulate the individual conductor wires according to PPS 9.09.

Step 4. Centre the flexible shield interconnect splice over the wire splice and adjust it so that each of the pre-tined ends overlap the exposed cable overbraid shields as shown below. Ensure that the gap between the end of the pre-tinned ends and the end of the wire outer jacket is 0" - 1/32". It is acceptable for the braided portion of the splice to extend slightly over the end of outer jacket provided the pre-tinned ends do not do so.



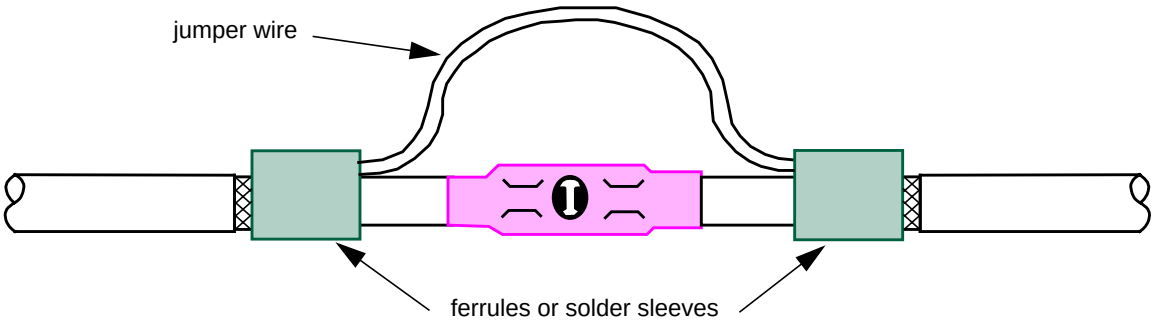
Step 5. Use a hot air gun to heat each of the pre-tinned ends until the solder melts and flows into the cable braid.

Step 6. Slide the outer sealing sleeve so that it is centred around the braid component of the flexible shield interconnect splice.

Step 7. Use a hot air gun to shrink the outer sealing sleeve in place. Begin heating at the middle of the sleeve until it shrinks and then move slowly toward each end. Heat the ends until the sealing inserts melt and begin to squeeze out from under the sleeve.

5.8.4 Jumper Wire Method

5.8.4.1 Install a jumper wire between the braided shields as shown below, using the procedures specified herein.



5.9 Insulating Shield Terminations and Splices

5.9.1 Insulate all non-insulating terminating hardware with white heat shrinkable insulating sleeves (ref. para. 4.1.3). Use clear insulation sleeving (ref. para. 4.1.4) if there is a need to visually check or verify identification markings after installation of the sleeve.

5.9.2 Cut the insulation sleeve to length so as to provide a minimum of 1/4" overlap onto the wire insulation at each end of the termination.

5.9.3 Locate the insulating sleeve on the termination so as to completely cover the terminating hardware and overlap approximately equally onto the wire insulation at each end of the termination.

5.9.4 Shrink the insulating sleeve in place according to PPS 10.16.

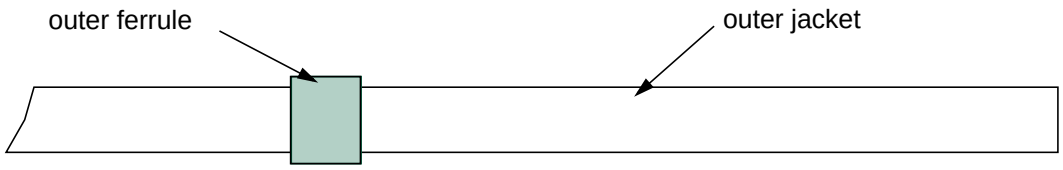
5.9.5 If the insulating sleeve cannot be slipped onto a splice after assembly, position the sleeve on the wires before assembly.

5.10 Terminating Shields Using Ferrules

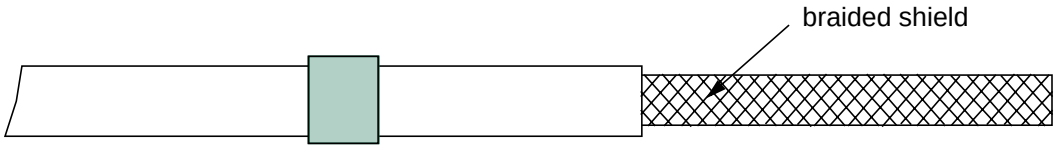
5.10.1 Terminating Single Shields Using Ferrules

5.10.1.1 Terminate single shields using ferrules as follows:

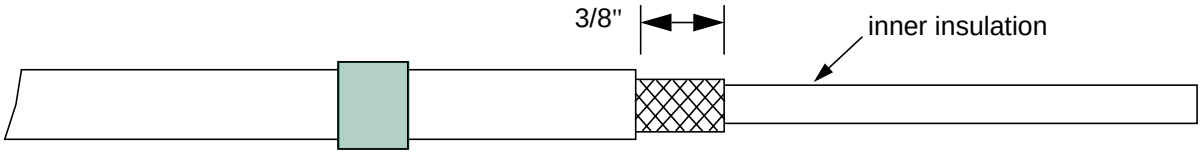
Step 1. Slide the outer ferrule over the outer jacket of the wire.



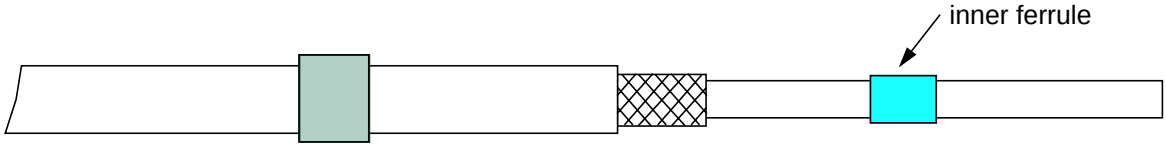
Step 2. Strip the outer jacket to the required length according to section 5.2.



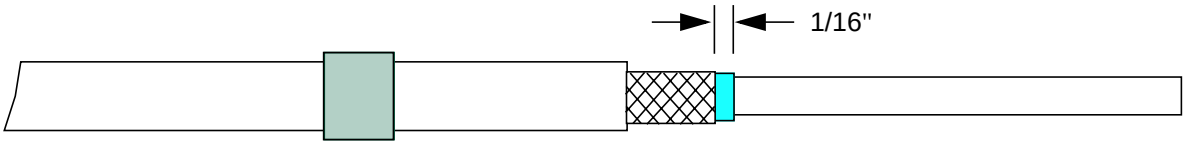
Step 3. Trim the exposed shield to approximately 3/8" according to section 5.3 as shown:



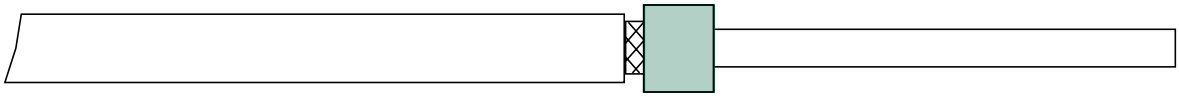
Step 4. Slide the inner ferrule over the inner insulation.



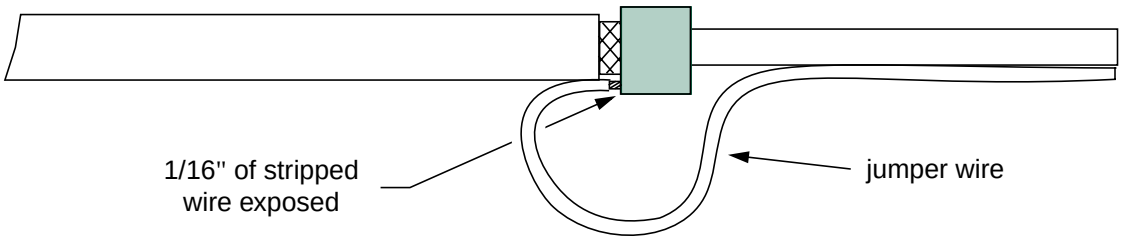
Step 5. Flare the end of the braided shield by rotating the centre conductor and slip the inner ferrule under the braided shield leaving approximately 1/16" of the inner ferrule exposed.



Step 6. Slide the outer ferrule into place over the inner ferrule so as to cover the end of the shield.



Step 7. If jumper or ground wires are to be included in the termination, slip the stripped ends, prepared according to section 5.5, under the outer ferrule leaving approximately 1/16" of the stripped wire exposed.



Step 8. Crimp the ferrules in place using the crimping tool specified in Table 4 (for DSC 46-X, Thomas & Betts GSC-XXX and Burndy YOC-XXX outer ferrules) or Table 5 (for M21980 outer ferrules). Crimping tools will not release until the full compression stroke is completed.

Table 4 - Crimping Tools for DSC 46-X, Thomas & Betts GSC-XXX and Burndy YOC-XXX Outer Ferrules

Outer Ferrule			Crimping Tool (Thomas & Betts)
DSC	Thomas & Betts	Burndy	
46-1	GSC-101	YOC 70	WT 231
46-3	GSC-149	YOC 90	WT 231
46-4	GSC-156	-	WT 202-20
46-5	GSC-175	YOC 112	WT 232
46-6	GSC-187	YOC 120	WT 232
46-7	GSC-194	-	WT 232
46-11	GSC-225	-	WT 209
46-12	GSC-232	YOC 150	WT 211-218
46-13	GSC-261	YOC 160	WT 233
46-14	GSC-275	-	WT 233
46-15	GSC-281	YOC 180	WT 234
46-16	GSC-287	-	WT 234
46-17	GSC-297	YOC 190	WT 234
46-18	GSC-312	YOC 200	WT 235
46-19	GSC-327	-	WT 234

Table 5 - Crimping Tools for M21980 Outer Ferrules

M21980 Outer Ferrule	M22520/5 Crimp Die (Note 1)	M21980 Outer Ferrule	M22520/5 Crimp Die (Note 1)
-101	-33	-275	-43
-128	-35	-281	-41
-149	-37	-287	-41
-156	-39	-297	-41
-175	-41	-312	-39
-187	-43	-327	-37
-194	-43	-348	-35
-199	-43	-359	-33
-205	-19	-375	-47
-219	-19	-405	-23
-225	-45	-415	-23
-232	-45	-460	-53
-261	-19	-500	-21

Note 1. For use with a M22520/5-01 basic crimping tool

5.10.2 Terminating Multiple Shields Using a Single Pair of Ferrules

5.10.2.1 Terminate multiple shields using a single pair of ferrules as follows:

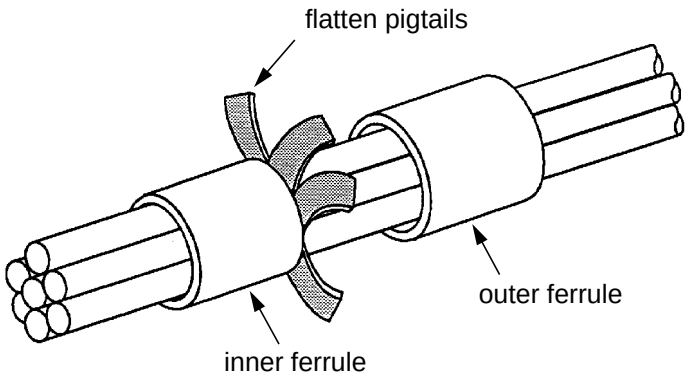
Step 1. Strip the outer jackets to the required length according to section 5.2.

Step 2. Form the braided shields into pigtails according to section 5.3.

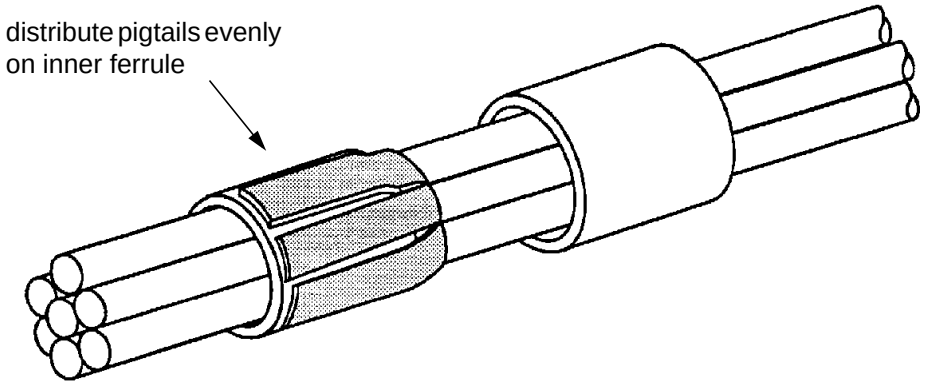
Step 3. Hold the wires tightly together and slide the outer ferrule over the wire bundle.

Step 4. Flatten the pigtails out as much as possible and trim to length so that they protrude radially out of the wire bundle by at least 1/2".

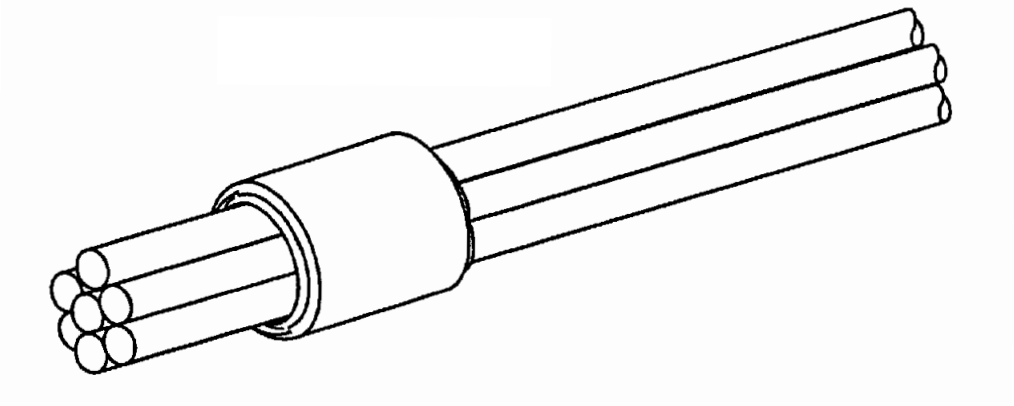
Step 5. Slide the inner ferrule onto the wire bundle until it butts against the pigtails as shown:



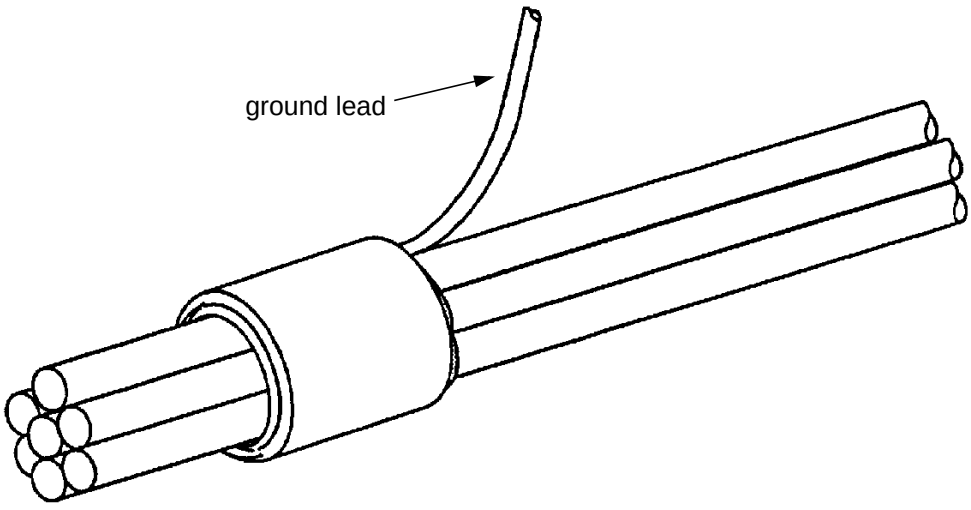
Step 6. Evenly distribute the pigtails on the outside of the inner ferrule.



Step 7. Slide the outer ferrule into place over the inner ferrule so that the ends of the ferrules are flush with one another as shown:



Step 8. If jumper or ground wires are to be included in the termination, slip the stripped ends prepared according to section 5.5, under the outer ferrule, leaving approximately 1/16" of the stripped wire exposed as shown:



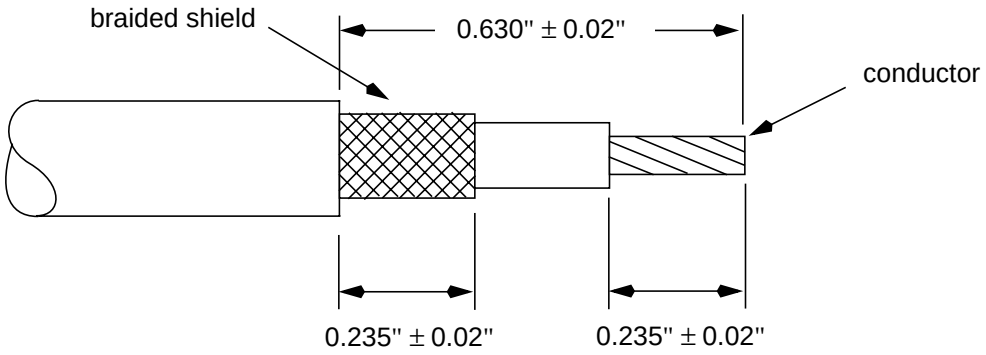
Step 9. Crimp the ferrules in place using the crimp tool specified in Table 4.

Step 10. Trim excess braid flush with the end of the crimped ferrules, ensuring that the inner insulation, or dielectric, is not nicked or cut.

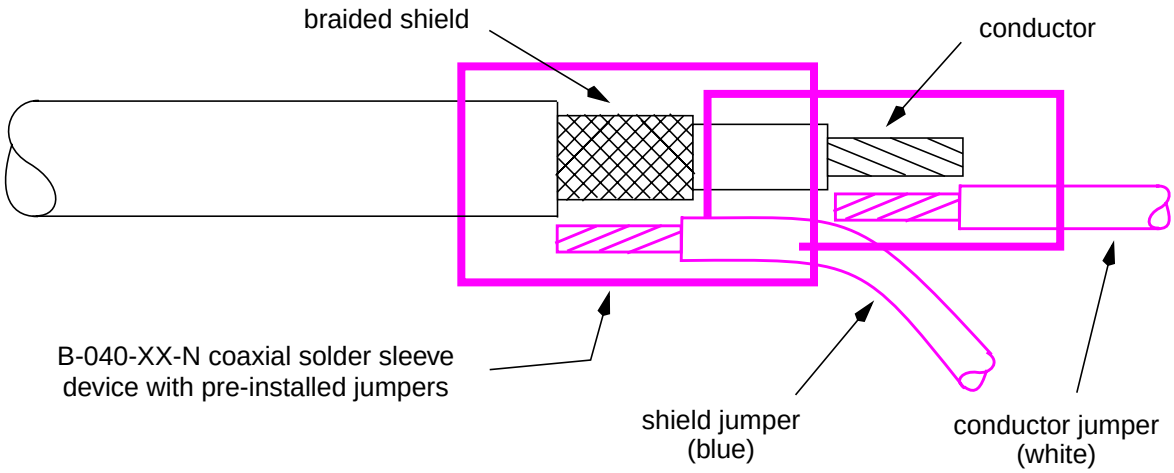
5.11 Installation of B-040-XX-N Coaxial Solder Sleeve Devices

5.11.1 B-040-XX-N coaxial solder sleeve devices are composed of heat shrinkable radiation cross-linked modified polyvinylidine fluoride insulation sleeves with solder preforms, meltable sealing rings and 2 pre-installed jumpers. The 'XX' portion of the part number represents the gauge of the jumper wires. Where the engineering drawing or wiring list specifies installation of B-040-XX-N coaxial solder sleeve devices on shielded cable, install as follows:

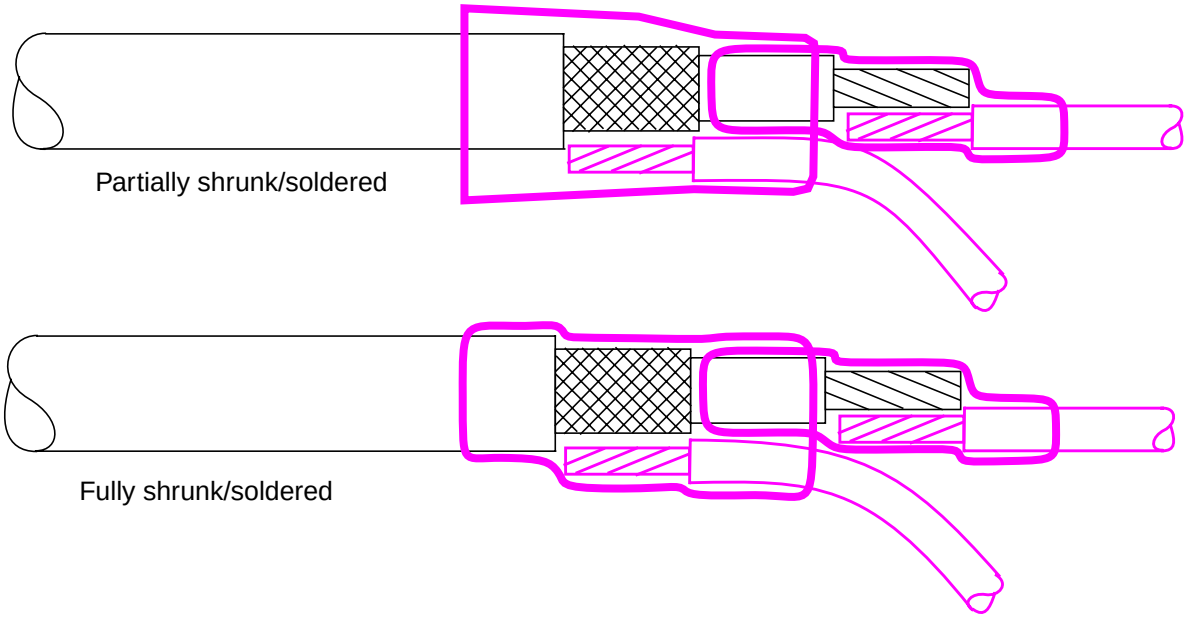
Step 1. Prepare the coaxial cable for termination as shown below.



Step 2. Slide the B-040-XX-N coaxial solder sleeve device onto the prepared coaxial cable as shown below.



Step 3. Use a hot air gun to apply heat to the B-040-XX-N coaxial solder sleeve device until the solder melts and the tube shrinks. Start with the heat gun centered over the center conductor/jumper wire joint, then move the heat gun so that it is centered over the cable outer shield/jumper wire joint. Apply just enough heat to completely melt and flow the solder in each case so as to form a fillet at each jumper wire. Avoid overheating as this will cause the solder to "wick" leaving insufficient solder at the joint.



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

6 Requirements

6.1 Ensure that termination types, locations and configurations conform to the instructions specified on the engineering drawing, wiring list, or PPS.

6.2 Ensure that ground or jumper wires are of sufficient length to allow for two service replacements while maintaining the minimum bend radii, unless otherwise specified by the engineering drawing or PPS.

6.3 Refer to PPS 9.39 for positioning of solder sleeve terminations of individual wire shields at connector adapters on DASH 8 Series 400 aircraft for EMI and HIRF protection. For all other terminations, solder sleeve shield terminations and B-040-XX-N coaxial solder sleeve devices must be positioned as specified in para. 5.1.1. Ensure that solder sleeves, HIRF splices and B-040-XX-N coaxial solder sleeve devices are not located in positions where they may be clamped or subject to flexing or bending. If the location requirements specified can not be met (e.g., harness bends prevent proper placement) refer to Liaison Engineering for disposition.

6.4 Solder sleeves, HIRF splices and B-040-XX-N coaxial solder sleeve devices must be staggered as much as practical and located on the outside of the cable group.

6.5 There shall be no evidence of looseness of any terminating hardware.

6.6 Check solder sleeves for compliance with the following:

- The encapsulation sleeve shall be completely shrunk in place and there shall be evidence of a slight extrusion of the sealing rings at each end of the sleeve.
- The solder preform shall be completely melted to form a fillet along the ground wire and braided shield. Solder sleeves showing incomplete melting of the solder preform may be re-heated to accomplish complete flow.
- A lack of fillet along the ground lead and braid indicates a solder sleeve that has been overheated. Overheated solder sleeves are not acceptable.

6.7 During installation of flexible shield interconnect splices (Raychem B-500-600-00), perform the following checks:

- Ensure that the correct wires are crimped together before installing crimp insulation sleeves.
- Ensure that the flexible solder shield is properly positioned and the solder is properly melted before installing the outer sealing sleeve.
- Slight to moderate bulging of shield interconnect splice in the area of conductor splices is acceptable.

6.8 After installation of rigid shield interconnect splices (Raychem D-150), perform the following checks:

- The solder shield sleeve shall not be loose, cut, or split. Slight discolouration is acceptable provided that the joint can be adequately checked.
- The sealing rings on the solder shield sleeve shall have flowed along the cable jacket.
- The solder shield sleeve shall be shrunk tightly around the cable jacket along its entire length.
- There shall be no strands protruding through the solder shield sleeve.
- Slight to moderate bulging of shield interconnect splice in the area of conductor splices is acceptable.

6.9 Ferrules shall not be crimped onto the outer insulating jacket of the shielded cable.

6.10 Jumper or ground wires included in crimped ferrule terminations shall show approximately 1/16" bare wire outside the crimped ferrule.

6.11 Heat shrinkable insulating sleeves shall be secure over the termination or splice and shall completely cover all non-insulated terminating hardware. Insulating sleeves which show evidence of overheating are not acceptable.

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.