DE HAVILLAND AIRCRAFT OF CANADA LIMITED

PPS 9.10

PRODUCTION PROCESS STANDARD

PROPRIETARY INFORMATION

STANDARD WIRING PRACTICES FOR DASH 8 DIGITAL DATA BUS

Issue 10
- This standard supersedes PPS 9.10, Issue 9.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@dehavilland.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

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PPS Group

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M&P Engineering

Issue 10 - 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”.
- Added cautionary notes regarding insulation resistance from Tyco manual.

TABLE OF CONTENTS

Sections **Page**

Figures

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the preparation and assembly of DASH 8 digital data bus electrical wiring harnesses.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS shall 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 shall 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 9.07 - Soldering of Electrical Terminals.

3.3 PPS 9.09 - Splicing Electrical Wire.

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

3.5 PPS 9.24 - Wire and Cable Stripping.

3.6 PPS 9.34 - Terminating Electrical Shields.

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

3.8 PPS 13.26 - General Subcontractor Provisions.

3.9 PPS 15.02 - Identification Coding of Electrical and Electronic Wires and Cables.

4 MATERIALS AND EQUIPMENT

4.1 Materials

4.1.1 Shielded twin-conductor RF cable to B0801140 (superseding shielded twin-conductor RF cable to DSC 369).

4.1.2 General purpose electrical wire to B0801250-22-9.

4.1.3 PTFE (Teflon) Insulated electrical wire

- MIL-W-16878/4-22-9 (White)
- MIL-W-16878/4-22-2 (Red)

4.1.4 Solder sleeves

- BACS13BH2
- DSC 359-3
- NAS 1744-4

4.1.5 Environment resistant splices

- M81824/1
- M81824/2

4.1.6 Heat shrinkable tubing, bulk length, M23053/5 (Flexible Crosslinked Polyolefin).

4.1.7 Heat shrinkable tubing, bulk length, M23053/8 (Semi-Rigid Crosslinked Polyvinylidine Fluoride - Kynar).

4.1.8 Crimp type electrical contacts as specified on the Engineering drawing or wiring list.

4.1.9 Solder type, shielded tri-axial connectors as specified on the Engineering drawing or wiring list.

4.1.10 Heat shrinkable identification sleeves, Raychem TMS Sleeves, 3/32" - 1/2".

4.2 Equipment

4.2.1 Use standard electrical shop equipment, as specified in the Production Process Standards listed in paragraph 5.1.2, for fabrication of the data bus wiring harness.

5 PROCEDURE

5.1 General

5.1.1 When installing splices, ensure that there will be enough wire on the stub leads for proper insertion and extraction of contacts.

5.1.2 Refer to the Production Process Standards listed below for the procedures to follow during the manufacture of Data Bus wiring:

- Strip wire insulation according to PPS 9.24.
- Terminate electrical shields according to PPS 9.34.
- Splice wires according to PPS 9.09.
- Crimp contacts according to PPS 9.36 or PPS 9.19, as applicable.
- Crimp electrical terminal lugs according to PPS 9.01.
- Solder wires to connectors according to PPS 9.07.
- Perform identification coding of wires according to PPS 15.02.

5.1.3 Measure insulation resistance of harness segments during fabrication or at the final harness assembly stage. Make sufficient measurements to demonstrate the insulation integrity of every segment of the harness.

5.1.3.1 To measure the insulation resistance between the bus conductors and the shield, connect the two bus conductors together. Connect the shield to the grounded side of the megohmeter and apply a dc potential of 100 volts between the bus conductors and the shield. The measured resistance must be greater than 1000 megohm. Omit this test if neither end of the bus conductors is available.

5.1.3.2 To measure the insulation resistance between the stub conductors and the shield, connect the two conductors together in each stub. Connect the shield to the grounded side of the megohmeter and apply a dc potential of 100 volts between the conductors and shield of each stub. The measured resistance must be greater than 1000 megohms.

5.2 Wiring Practice

5.2.1 In order to ensure proper functioning and operation of the digital data network, it is essential that the general guidelines listed below are followed at all times during the fabrication and assembly of the electrical wiring harness.

5.2.1.1 Use environment resistant splices for all stub lead splices.

5.2.1.2 Use solder sleeves for all shield terminations.

5.2.1.3 Use 22 gauge general purpose insulated wire (B0801250-22-9) for all shield grounding and jumper applications.

5.2.1.4 Unless otherwise specified by the engineering schematic, make all stub lead terminations to **B0801140** shielded twin-conductor RF cable using 22 gauge PTFE (Teflon) insulated wire as follows (see Figure 3, Figure 5, Figure 6 and Figure 8):

- Use **white (**MIL-W-16878/4-22-9) stub leads for **tan (or brown)** B0801140 cable wire (marked ‘C’ or ‘COLD’ on engineering schematics, typ.).
- Use **red** (MIL-W-16878/4-22-2) stub leads for **white** B0801140 cable wire (marked ‘H’ or ‘HOT’ on engineering schematics, typ.).

5.2.1.4.1 Shielded twin-conductor RF cable to B0801140 has superseded shielded twin-conductor RF cable to DSC 369 which has resulted in a change in the colour of conductor insulation. DSC 369 shielded twin-conductor RF cable had one conductor with tan coloured insulation and one conductor with tan/black insulation (i.e., tan colour with a black tracer), whereas B0801140 shielded twin-conductor RF cable has one conductor with white coloured insulation and one conductor with tan coloured insulation.

5.2.1.4.2 Ensure that the length of the stub leads is sufficient for proper insertion and extraction of contacts.

5.2.1.5 Keep the stub leads the same length, within ± 0.2", at all terminations.

5.2.1.6 Keep the length of unshielded wire at each termination less than 3".

5.2.1.7 Prepare the shielded wire ends at each termination as specified in Figure 1.

5.2.1.8 Connect the AFCS transmission lines in a daisy chain fashion between user sub-systems. The cable length between users shall not be less than 24" and, in order to facilitate repair or rework of the wiring harness, it is recommended that a minimum of 6" excess length be provided between each sub-system.

5.2.1.9 If specified on the engineering drawing or wiring list, identify splice junctions using a heat shrinkable identification sleeve (see Materials section, paragraph 4.1.10) cut to approximately 1/2" in length.

5.2.1.10 Run all data bus wiring separately from general avionic and electrical cables.

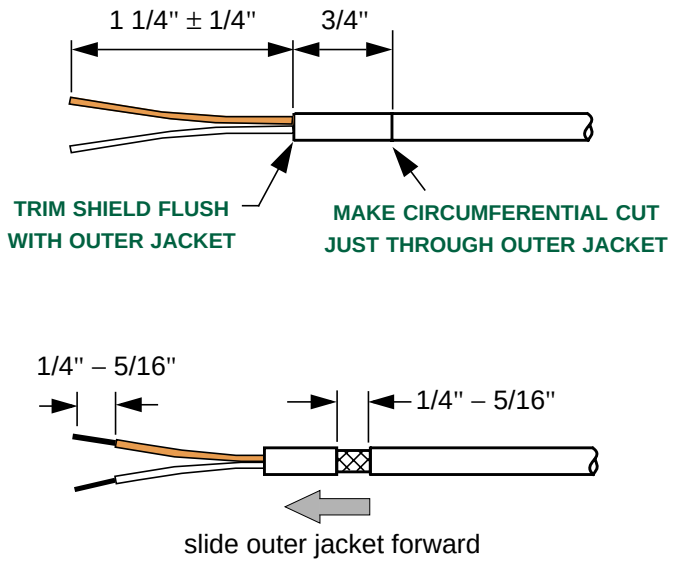


FIGURE 1-A - FEED THROUGH OR SUB-SYSTEM TERMINATION

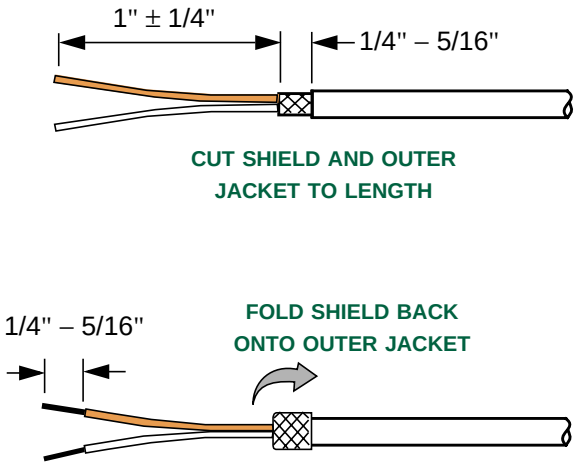


FIGURE 1-B - FLOATING SHIELD TERMINATION

FIGURE 1 - PREPARATION OF SHIELDED WIRE ENDS

5.3 Feed Through Termination

5.3.1 Feed through terminations are typically used to interconnect individual cable assemblies in the wiring harness.

5.3.2 Refer to Figure 2 for a general description of the typical wiring diagram schematic.

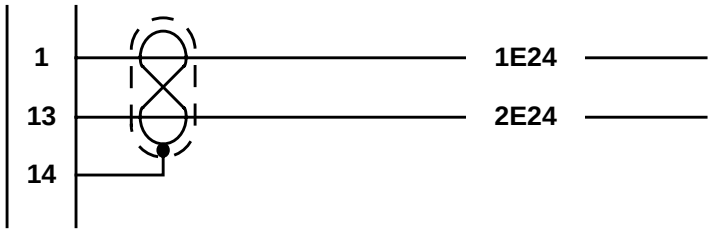


FIGURE 2 - FEED THROUGH TERMINATION WIRING DIAGRAM SCHEMATIC

5.3.3 Refer to Figure 3 for a general description of the assembled termination and recommended sequence of assembly.

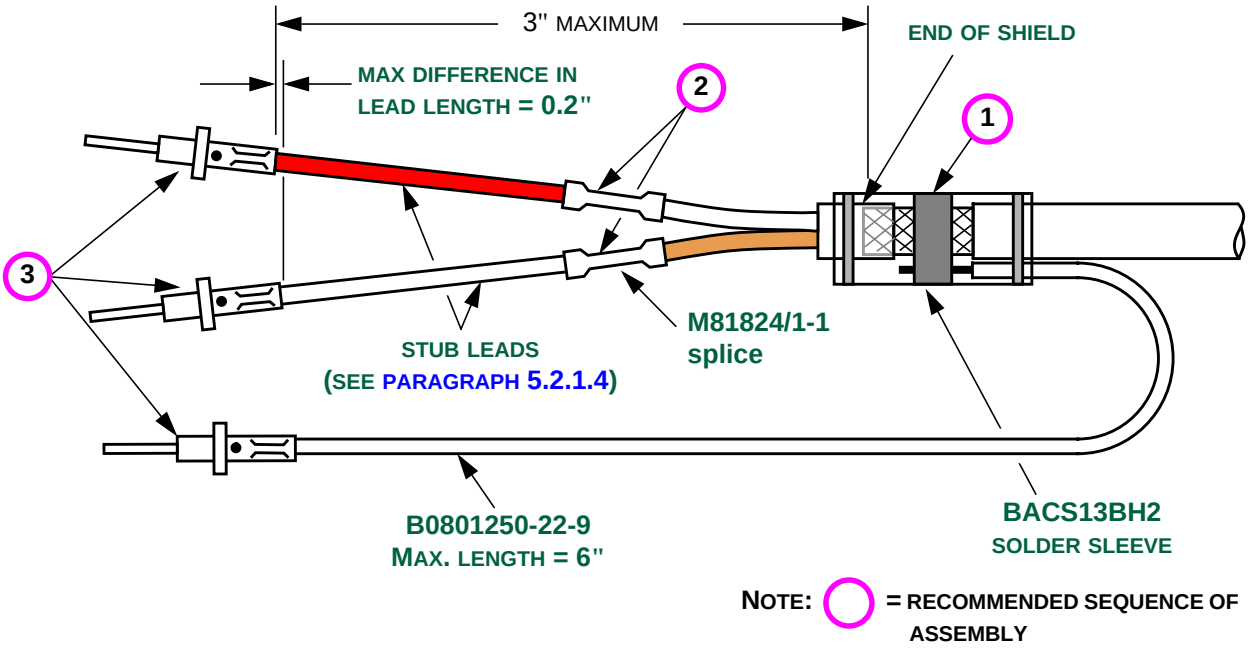


FIGURE 3 - GENERAL ASSEMBLY ARRANGEMENT OF FEED THROUGH TERMINATION

5.4 Sub-System Termination

5.4.1 Sub-system terminations are used to interconnect individual components in the AFCS in a daisy chain fashion.

5.4.2 Refer to Figure 4 for a general description of the typical wiring diagram schematic.

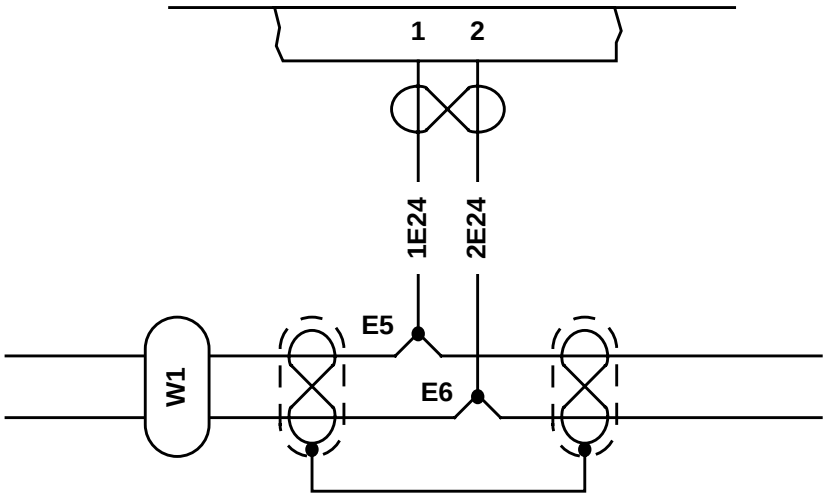


FIGURE 4 - SUB-SYSTEM TERMINATION TYPICAL WIRING DIAGRAM SCHEMATIC

5.4.3 Refer to Figure 5 for a general description of the assembled termination and recommended sequence of assembly. In place of using a single solder sleeve as shown in Figure 5, it is acceptable to substitute two smaller solder sleeves connected via a jumper wire as shown in Figure 6.

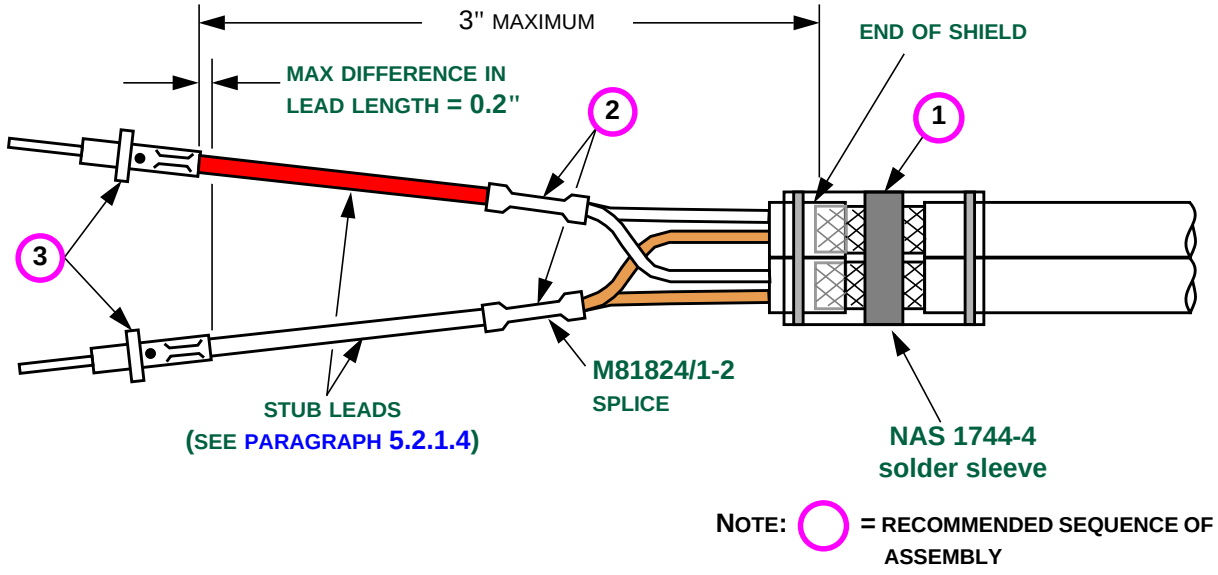


FIGURE 5 - GENERAL ASSEMBLY ARRANGEMENT OF SUB-SYSTEM TERMINATION

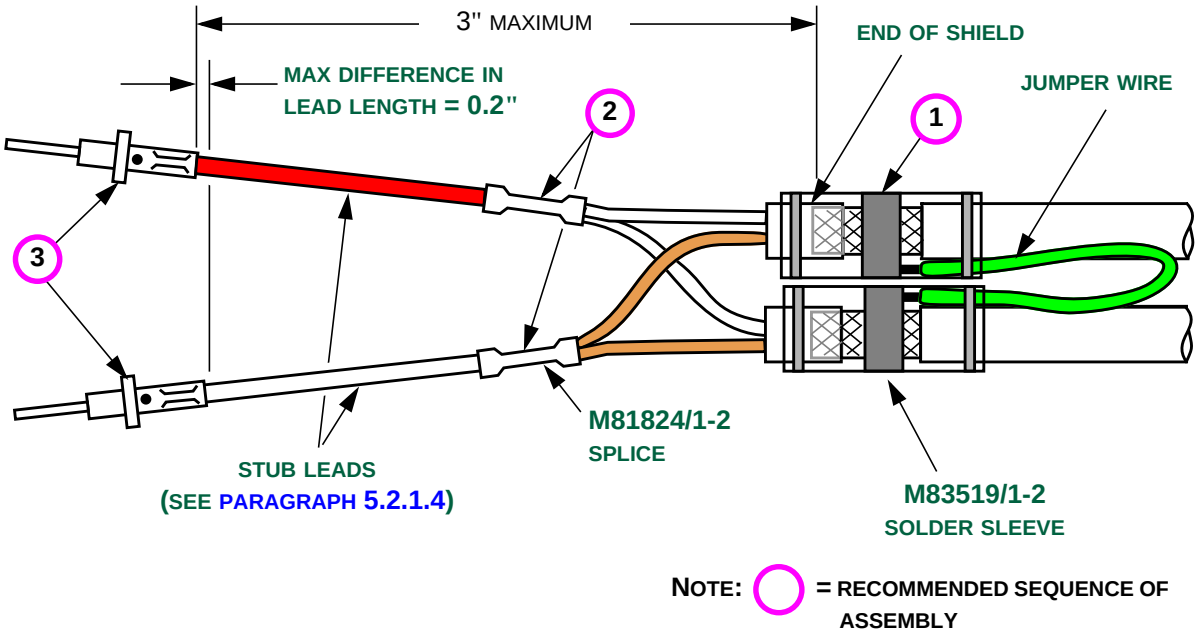


FIGURE 6 - ALTERNATE ASSEMBLY ARRANGEMENT OF SUB-SYSTEM TERMINATION

5.4.4 If a shield ground is specified on the Engineering drawing, include a B0801250-22-9 ground wire in the shield splice, similar to that shown in Figure 3.

5.5 Floating Shield Termination

5.5.1 Floating shield terminations are typically used to connect the last sub-system component in the wiring harness daisy chain.

5.5.2 Refer to Figure 7 for a general description of the typical wiring diagram schematic.

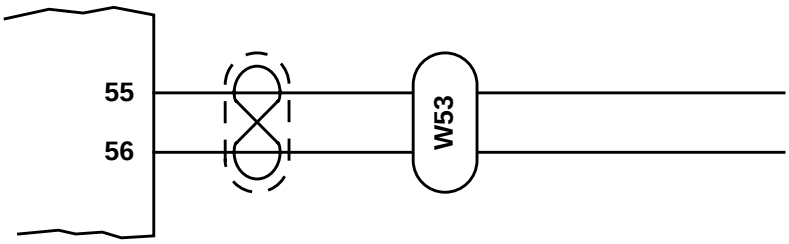


FIGURE 7 - FLOATING SHIELD TERMINATION WIRING DIAGRAM SCHEMATIC

5.5.3 Refer to Figure 8 for a general description of the assembled termination and recommended sequence of assembly.

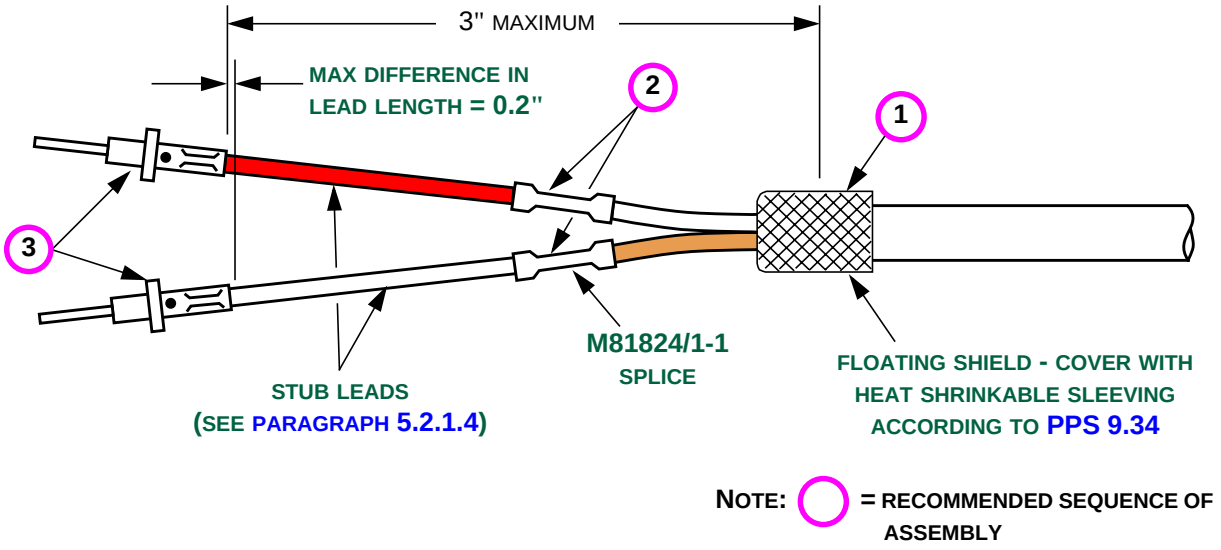


FIGURE 8 - GENERAL ASSEMBLY ARRANGEMENT OF FLOATING SHIELD TERMINATION

5.6 Tri-Axial Test Point Connections

5.6.1 Each of the shielded cables in the data bus wiring harness are broken at a common point using shielded tri-axial connectors to facilitate interconnecting the AFCS ground test equipment.

5.6.2 Refer to Figure 9 for a general description of the connector components.

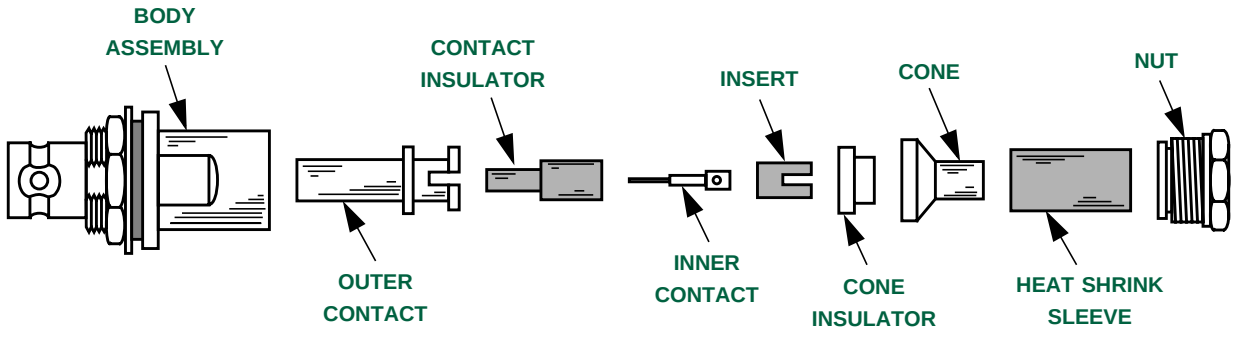
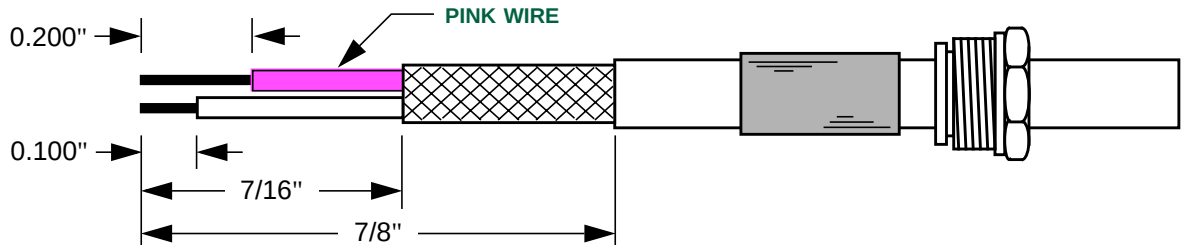


FIGURE 9 - GENERAL DESCRIPTION OF TRI-AXIAL CONNECTOR COMPONENTS

5.6.3 Prepare wires and assemble connector as follows:

Step 1. Slide the nut and heat shrink sleeve onto the cable.

Step 2. Trim the shield and outer jacket and strip the wires to the lengths shown below:



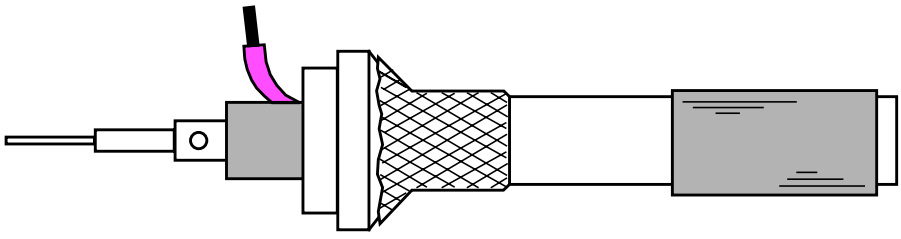
Step 3. Tin the wire ends.

Step 4. Slide the cone over the wires and under the shield.

Step 5. Slide the cone insulator under the cone.

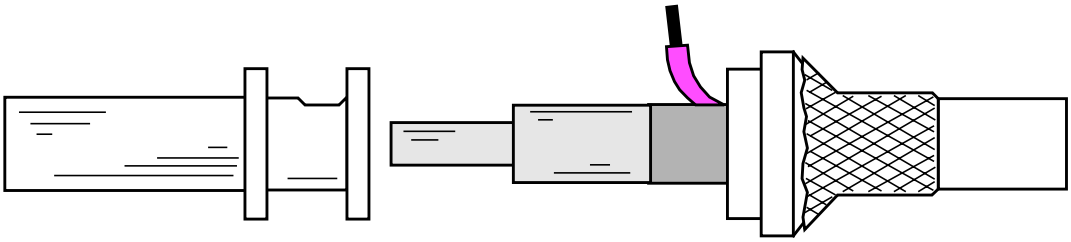
Step 6. Install the insert over the white wire with the pink wire through the insert slot.
Note: For PIC cable, the “pink” wire is brown/black and the “white” wire is brown.

Step 7. Assemble the inner contact onto the white wire and solder at the hole.



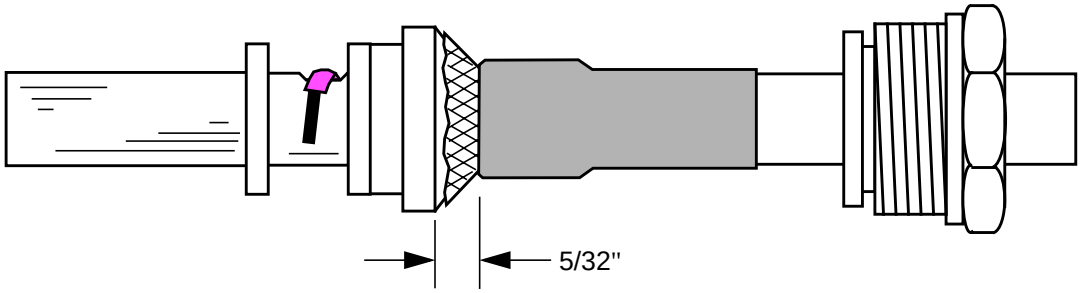
Step 8. Assemble the contact insulator over the inner contact.

Step 9. Place the outer contact over the contact insulator to butt against the cone insulator.

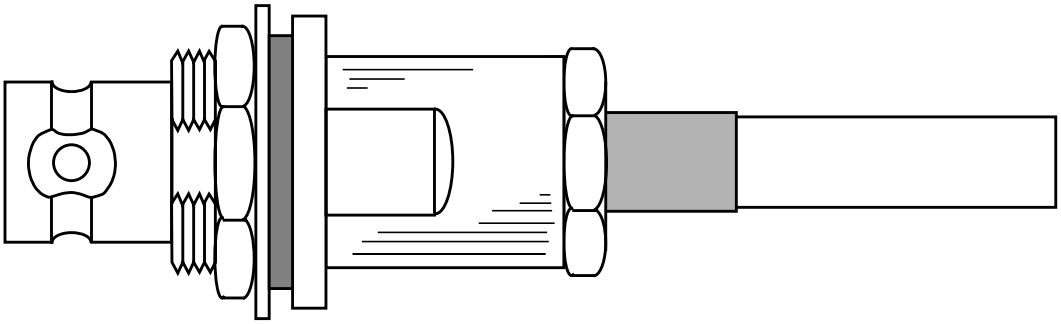


Step 10. Solder the pink wire to the outer contact.

Step 11. Position the heat shrink sleeve over the jacket and shield as shown below and shrink into place.



Step 12. Thread the nut and bolt assembly together and torque to 30 - 40 inch pounds.



6 REQUIREMENTS

6.1 Completed data bus wire harness assemblies shall conform to the configuration specified on the Engineering drawing and to the standard wiring practices specified in section 5.2.

6.2 Individual terminations and connections on the data bus wiring harness shall conform to the applicable general assembly arrangement as shown in Figures 3 to 8 and in section 5.6.

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 Follow the standard safety precautions as specified in the electrical Production Process Standards (PPS's) listed in paragraph 5.1.2 at all times during fabrication of the digital data bus wire harness as specified herein.

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for the preparation and assembly of DASH 8 digital data bus electrical wiring harnesses shall have a good working knowledge of the applicable procedure and requirements as specified herein and shall have exhibited their competency to their supervisor.