Termination of D-621 Triaxial Connectors to Shielded Twisted Pair Cable for MIL-STD-1553B Applications

This Engineering Standard forms a part of Engineering Standard ES-61162:
"D-621 Connectors Termination Manual"

Contents

1.0 Purpose And Scope

This engineering standard describes procedures for terminating Raychem D-621 series triaxial plug and Jack connectors, with bayonet or threaded coupling, to shielded twisted-pair cables for use in MIL-STD-1553B applications. These procedures are applicable to components with the following part number patterns:

D-621-XXXX	Connector body
DK-621-XXXX	Connector kit
DK-621-XXXX-X	Connector kit
DK-621-XXXX-XX	Connector kit
D-602-0126	Pin contact
D-602-0127	Socket contact

2.0 References

AA-400	SuperHeater Instructions

3.0 Tools*

Steinel Heating Tool HL1802E with nozzle 07460 (commercially available)

AA-400	SuperHeater hot air heater with mini SolderSleeve tip
AD-1319	holding fixture
AD-131-14	adapter
AD-1297	trimmer for twisted pair cable, AWG 22.
AD-1298	trimmer for twisted pair cable, AWG 24 and 26.
AD-1564	triaxial connector termination support tool.
AD-1447	contact removal tool.
AD-1464	contact removal tool.
AD-1480	repair holding fixture.

CV-1980 and CV-1981 Infrared heaters (Europe only)

4.0 Materials

Solder:	Type Sn63 per QQ-S-571
Flux:	Type RMA per MIL-P-14256 (Alpha No. 611)

***NOTE**: CV-5300 and CV-5700 heaters (referred in previous ES's) are no longer available.

5.0 Procedures

5.1 Cable Accommodation

D-621-0XXX connectors* will accommodate solderable twinaxial cables with dimensions shown in Figure 5-1 or Raychem part number shown in Table 5.1.

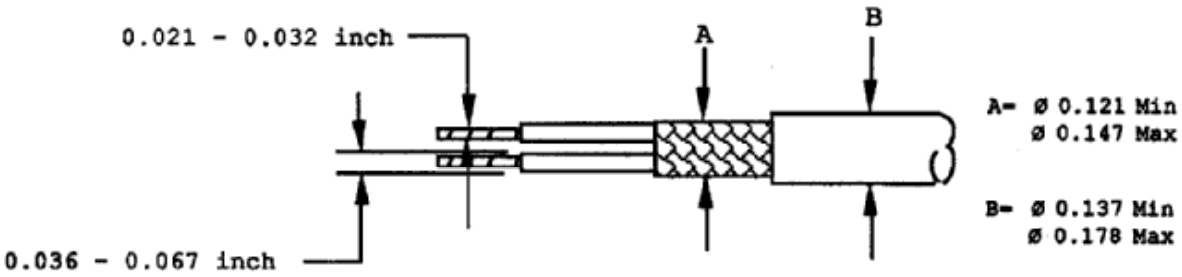


Figure 5-1
Twinaxial Cable Accommodation for D-621-0XXX Connectors

Table 5-1 Raychem Twinaxial Cable for D-621-0XXX Connectors

Cable Group	Raychem Twinaxial Cable
Group 1 (Small diameter)	6329 10595 10602 10606 10612
Group 2 (Large diameter)	6499 10605 10613 10614

***Note**:

For Connectors with date codes prior to 1992, D-621-0XXX connectors only accommodated Group 1 cables, D-621-1XXX connectors were designed for use with Group 2 cables.

5.2 Twinaxial Cable Preparation

Note: Special cable preparation dimensions applicable to long-reach jack connectors are indicated where applicable.

1. Slide the strain relief sleeve and braid terminator over the cable, and push them back out of the way (Figure 5-2).

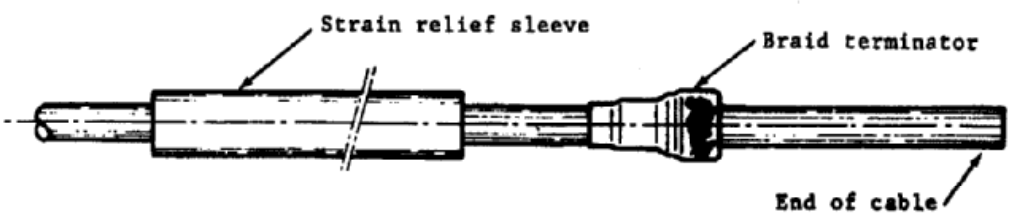


Figure 5-2
Sliding Strain Relief Sleeve and Braid Terminator onto Cable

2. Strip the cable jacket and shield layer (s) as shown in Figure 5-3.
   For standard plug and jack connectors:
   A = 0.250 ± 0.015
   B = 0.750 ± 0.015

   For long-reach jack connectors:
   A =0.700 ± 0.015
   B = 1.200 ± 0.015

Figure 5-3
Cable Jacket and Shield: Initial Stripping

3. Comb out the outer braid and fold it back over the jacket.

   - See Figure 5-4 for cable without inner braid.
   - See Figure 5-5 for cable with inner braid.

Figure 5-4
Outer Braid Preparation: Twinaxial Cable without Inner Braid

Figure 5-5
Outer Braid Preparation: Twinaxial Cable with Inner Braid

4. If mu-metal tape is present, trim it as shown in Figure 5-6.

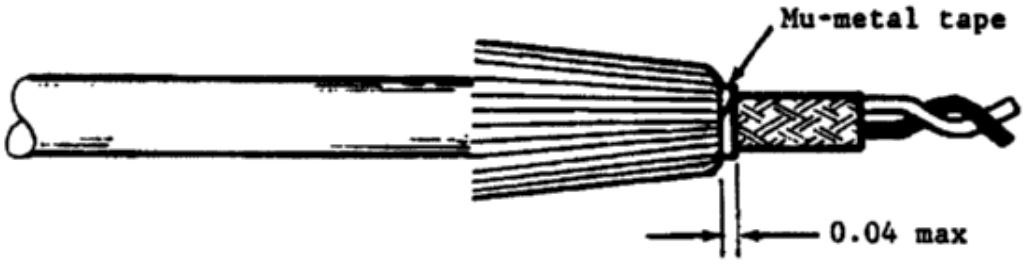


Figure 5-6
Mu-Metal tape Preparation: Twinax Cable with Mu-Metal Tape

5. If inner braid is present, comb it out and fold it back over the jacket as shown in Figure 5-7.

Figure 5-7
Inner Braid Preparation: Twinax Cable with Inner Braid

6. Straighten the twisted pair wires (Figures 5-8)

Figure 5-8
Twinax Cable Preparation: Conductors Ready to Strip

7. Strip the cable conductors to the dimensions shown in Figure 5-9.

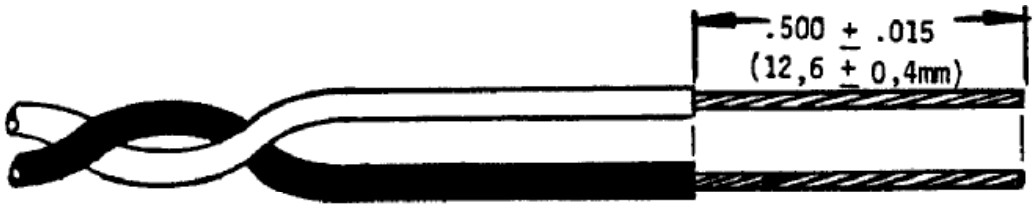


Figure 5-9
Cable conducator Stripping Dimensions

8. Make sure that the conductor strands are twisted into their normal lay. Retwist and smooth the strands with fingers, if necessary.

9. Pratin stranded wire and unplated solid wire to within 0.05 inch of the insulation, using Sn63 solder and RMA flux per QQ-S-571 (Figure 5-10).

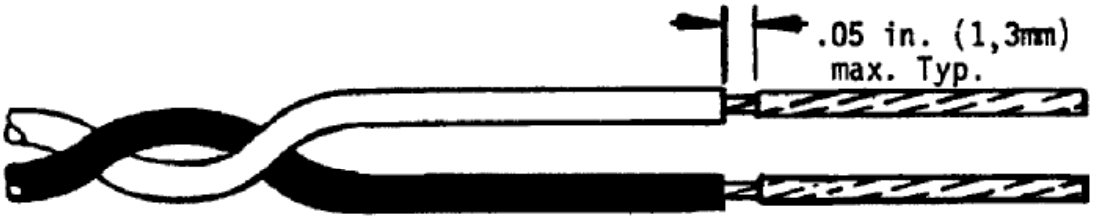


Figure 5-10
Pretinned Cable Conductors

10. Trim the signal and ground conductors as shown in Figure 5-11.

    - Use the AD-1297 conductor trimming tool for AWG 22 conductors.

    - Use the AD-1298 conductor trimming tool for AWG 24 or 26 conductors.

11. Proceed to Section 5.3.

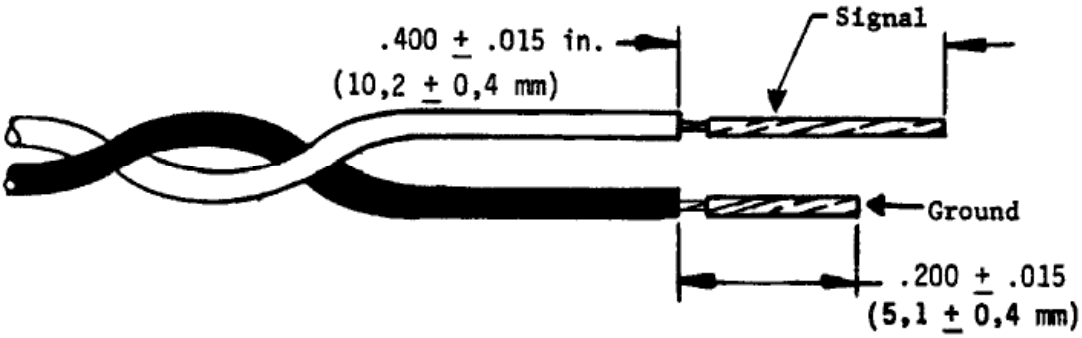


Figure 5-11
Cable Conductor Trimming Dimensions

5.3 Inserting Prepared Cable into Contact

1. Make sure that the required strain relief sleeves and braid terminators are slid back over the prepared cable (See Figure 5-2).

2. Start the cable conductors into the SolderTacts contact as follows:
   - Signal (longer) conductor into the inner (small-diameter) insulating sleeve.
   - Ground (shorter) conductor into the space between the inner sleeve and the outer sleeve, at a point between and below the rear inspection windows. (not lined up with either of the inspection windows).

3. Push both conductors into the contact until they are fully inserted.
   - While pushing the wires in, rotate the contact slightly back and forth to prevent the wires from catching.
   - Be careful not to force the wires too far into the contact.
   - Do not twist the contact or wires.

4. Inspect the wires for proper positioning inside the SolderTacts contact (Figure 5-12).
   - The signal conductor must be visible through one of the inspection windows near the middle of the contact, and must extend through the solder preform.
   - The ground conductor must be located between and below the two inspection holes near the rear of the contact (not -directly in line with either of the two inspection holes).
   - The end of the wire insulation must be no less than 0.01 inch and no more than 0.10 inch from the contact body.

3. Proceed to section 5.4.

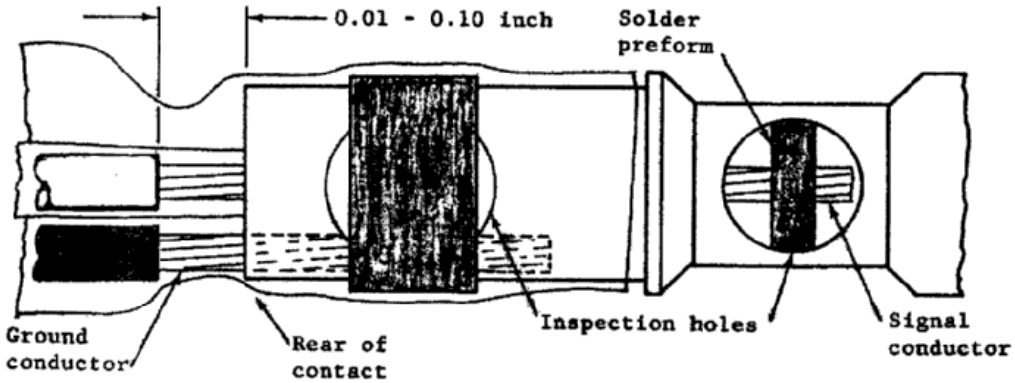


Figure 5-12
Inspection for Proper Cable Insertion

5.4 Heating Procedure

- NOTE: Either the AD-1319 holding fixture and adapter, or the AD-1480 repair holding fixture, must be used to prevent damage to the contacts.

1. If the AD-1319 holding fixture is to be used, install the AT-1319-14 adapter and set up the dimensions as shown in Figure 5-13.

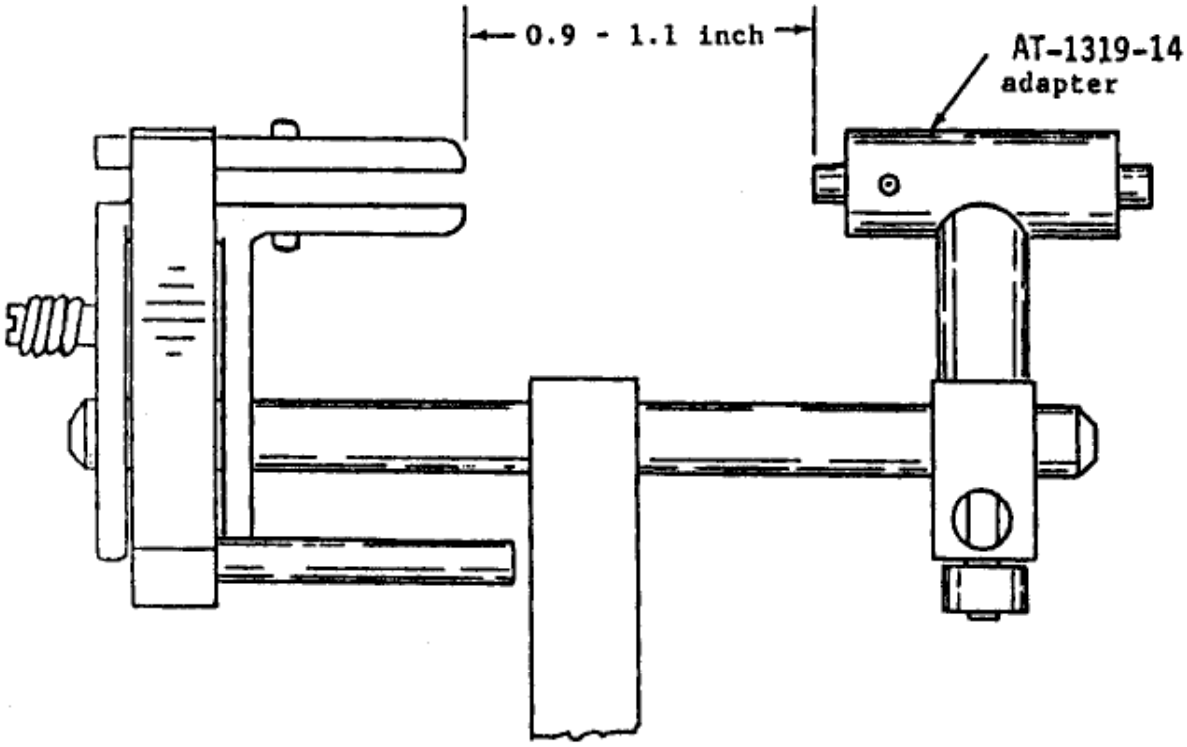
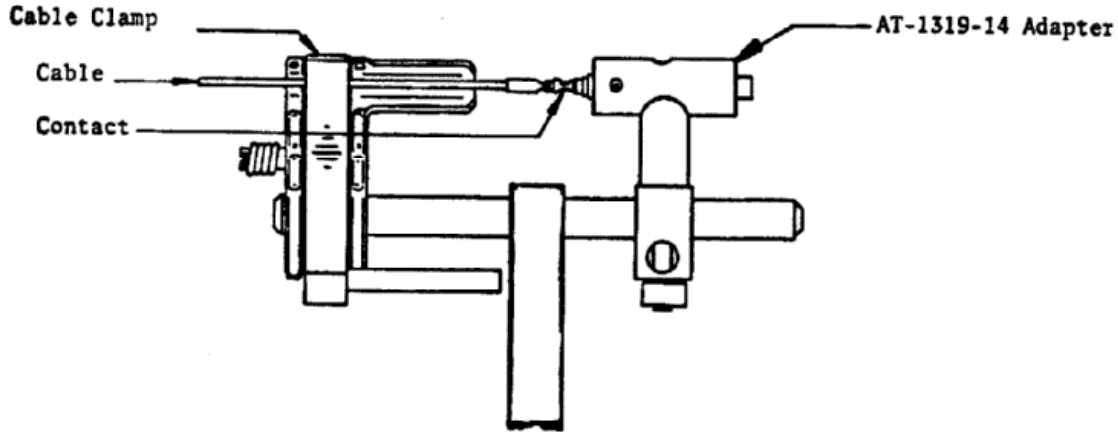


Figure 5-13
Set-up Dimensions for AD-1319 Holding Fixture

2. Insert the contact / cable assembly into the appropriate end of the AT-1319-14 adapter or AD-1480 repair holding fixture (Figure 5-14).

   - D-602-0126 pin contact into "P" end of holding fixture.
   - D-602-0127 socket contact into "S" and of holding fixture.



AD-1319 Holding Fixture and AT-1319-14 Adapter With Contact/Cable Assembly

AD-1480 Repair Holding Fixture With Contact / Cable Assembly
(Outer Pin Contact Shown For Reference)

Figure 5-4
Contact/Cable Assembly Inserted into Holding Fixture

3. If the AD-1319 holding fixture is used, clamp the twisted-pair cable in the cable clamp.

   - The cable must be fully inserted into the contact.
   - The contact must be fully inserted into the adapter.
   - The cable must be straight between the contact and the cable clamp.

4. Heat the contact using one of the heating tools listed in Section 3.0.
   - Use the appropriate reflector listed in Section 3.0.
   - Allow the heating tool to warm up for at least 30 seconds before contacts are heated.
   - Position the contact in the heating tool reflector as shown in Figure 5-15, so that the inspection windows nearest the middle of the contact are centered in the reflector.
   - Direct hot air around the contact until the solder preform in the inspection windows nearest the middle of the contact has melted and flowed. The solder preform in the inspection windows at the rear of the contact should have melted and flowed by this time; if it has not, direct hot air at the rear inspection windows until the solder preform melts and flows.
   - **CAUTION**: Allow the solder to solidify before disrupting the contact or cable.

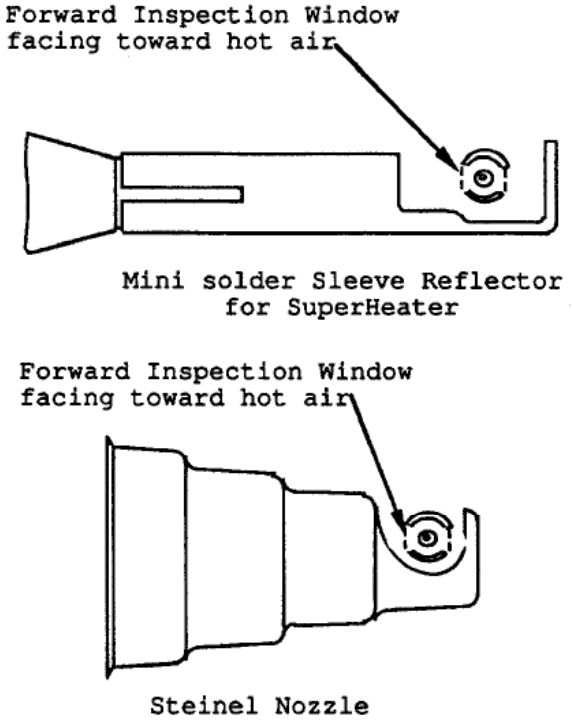


Figure 5-15
Contact Positioning in Heating Tool Reflectors

5. Inspect the completed termination (See Section 5.5).

5.5 Inspection of Terminated Contacts

5.5.1 Inspection for Correct Assembly

Inspect the completed termination for correct assembly as follows:

- The signal conductor must be visible through one of the inspection windows near the middle of the contact.
- The distance from the contact body to the ground wire insulation shall not exceed 0.13 inch (Figure 5-16).
- The ground wire insulation shall not extend into the contact body.
- The ground conductor must not be positioned directly behind either of the two inspection windows at the rear of the contact, but must be soldered to the inside surface of the contact body at a point between the two rear inspection windows.

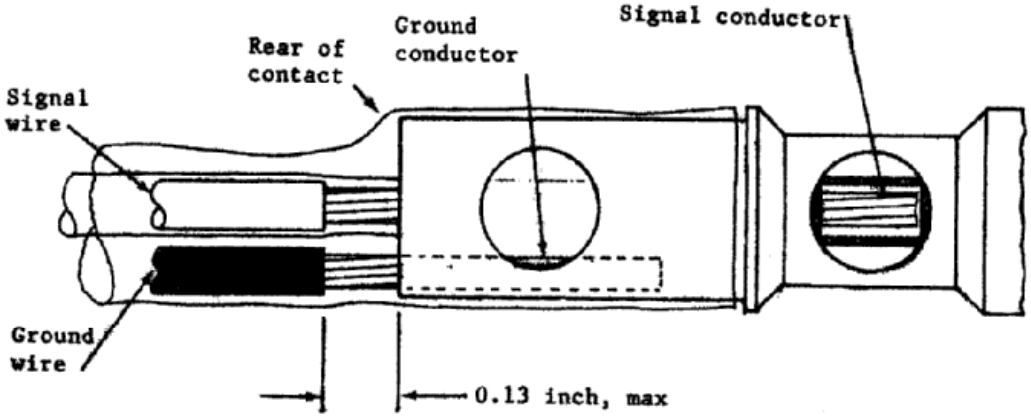


Figure 5-16
Inspection for Proper Assembly

5.5.2 Inspection for Proper Heating

1. The solder preform in the inspection windows near the middle of the contact must be melted and flowed so that the preform does not retain any of its original ring shape, and a solder fillet is visible between the signal conductor and the inner surface of the contact.

    - The solder may leave a visible trace or shadow of its original shape. This is acceptable as long as there are no remnants of the preform shape.

    - Remnants of unmelted or partially melted solder indicate underheating.

    - Lack of sufficient visible solder indicates overheating.

2. The solder preform in the inspection windows near the rear of the contact must be melted and flowed so that the preform does not retain any of its original ring shape, and the solder has flowed into the contact through the rear inspection windows.

    - The solder may leave a visible trace or shadow of its original shape. This is acceptable as long as there are no remnants of the preform shape.

    - Remnants of unmelted or partially melted solder indicate underheating.

    - Lack of sufficient visible solder indicates overheating.

3. The insulating sleeves must be shrunk over the area of exposed conductor between the wire insulation and the contact.

    - The insulating sleeves may remain flared at the end over the wire insulation.

4. The insulating sleeves must not be darkened such that the solder joints cannot be visually inspected.

    - If the sleeves are so dark that the solder joints cannot be visually inspected, the contact is overheated and must be rejected.

5. The twisted-pair cable insulation must not show signs of damage or overheating outside of the insulating sleeve.

5.6 Repair and Rework of Contact Terminations

5.6.1 Underheated Terminations

1. Reheat underheated areas as directed in Paragraph 5.4.

   - Minimize heat application to areas that have been properly heated.

2. Reinspect as directed in Paragraph 5.5.

5.6.2 Overheated or Improperly Assembled Terminations

1. Remove the contact from the cable as directed in Section 5.6.3.

2. Check the cable for damage or incorrect stripping.

   - If the cable is damaged, cut off the damaged portion and restrip as directed in Paragraph 5.2.

   - If the strip length is incorrect, restrip to the required dimensions (Figure 5-9).

3. Install a new contact (Paragraphs 5.3, 5.4 and 5.5).

5.6.3 Removing Contacts from Cable

1. Slit the outer insulating sleeve full length on opposite sides of the contact using a sharp knife or razor blade.

   - **CAUTION**: Avoid cutting into the wire insulation.

2. Peel off the outer insulating sleeve with pliers.

3. Slit the inner insulating sleeve in the area outside of the contact body.

   - **WARNING**: Safety glasses must be worn during the following heating operation to prevent danger to eyes from hot solder.

4. Hold the contact with pliers, heat the contact using one of the heating tools listed in Section 3.0, and pull the contact off the cable when the solder malts.

5.7 Installing Terminated Contacts into D-621 Connectors.

1. Insert the terminated SolderTacts contact into the rear of the D-621 connector until the retention clips lock the contact in place.

   - Contacts can be removed from D-621 connectors using the AD-1447 or AD-1464 removal tool.

2. Dress the cable braid forward over the rear of the D-621 connector.

3. Trim the braid strands to the length shown in Figure 5-17.

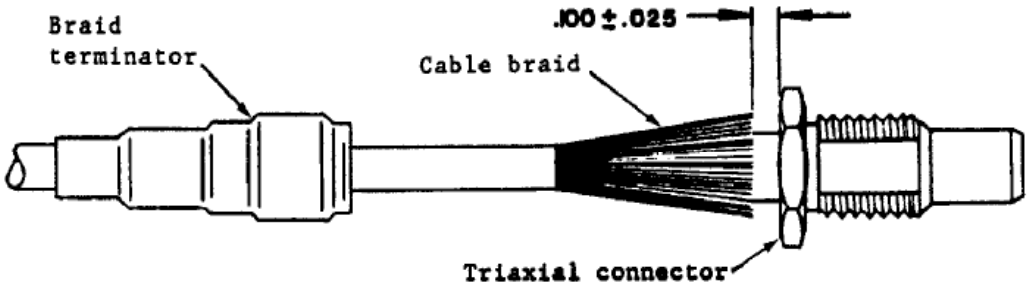


Figure 5-17
Trimming Dimension for Braid Strands

4. Slide the braid terminator over the rear of the D-621 connector and over the braid, until it bottoms against the D-621 connector (Figure 5-18).

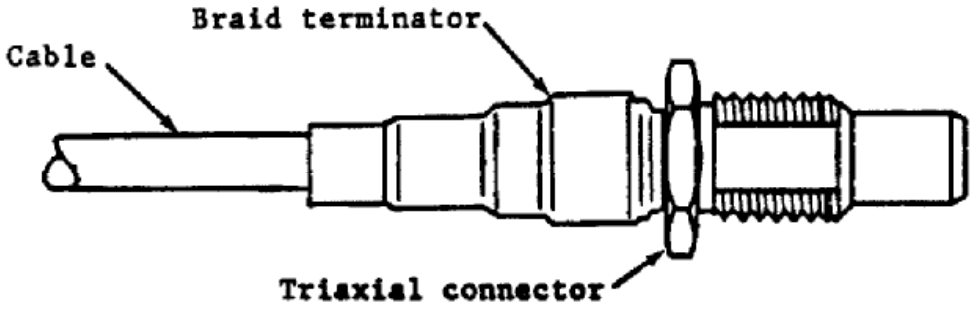


Figure 5-18
Braid Terminator Positioned over Rear of D-621 Connector

4. Heat the braid terminator to solder the braid and shrink the insulation sleeve.

   - The AD-1564 triaial connector support tool must be used to fixture the D-621 connector during heating; otherwise, damage to the D-621 connector will result.

   - Use the AA-400 Superheater with SolderSleeve reflector or the Steinel heater with nozzel.

   - Operate tools in accordance with the heating tool instructions listed in Section 2.0, and observe all precautions and warnings.

   - Position the assembly in the heating tool reflector as shown in Figure 5-19, and begin heating at the end of the braid terminator next to the D-621 connector body.

   - Heat until the solder melts, flows and wets to the braid strands and D-621 connector body. Heat the rest of the braid terminator until the sleeve shrinks onto the cable and D-621 connector. Rotate the assembly during heating to assure even distribution of heat.

   - **WARNING**; The heating tool and the D-621 connector assembly become hot during termination. To prevent burns, allow tools and D-621 connector to cool before handling.

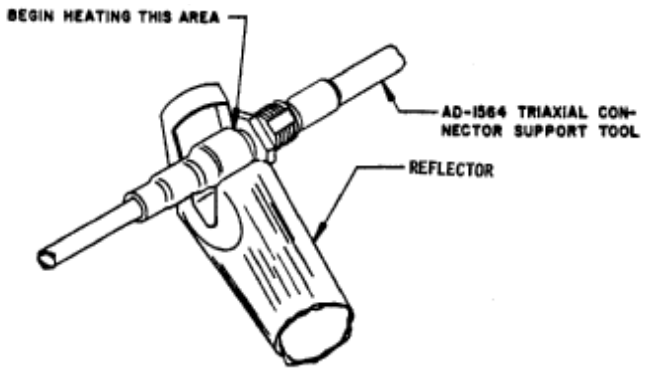


Figure 5-19
Heating the Braid Terminator

6. Visually inspect the braid termination as follows:

   - Positioning--The braid must overlap the outer body of the D-621 connector at least 0.125 inch.

   - Heating--The solder must have melted, flowed and wetted to the braid strands and D-621 connector body. The heat-shrinkable sleeve must be shrunk onto the shield braid, but must not be darkened so as to prevent visual inspection of the braid strands.

   - Rework--If the braid termination does not meet these positioning and heating requirements, rework as directed in 5.8.

7. Slide the strain relief sleeve over the braid terminator and position it against the D-621 connector.

8. Heat the strain relief sleeve to shrink it onto the braid terminator and cable.

   - Use the same tools and procedures as for the braid terminator.

   - **WARNING:** The heating tool and the D-621 connector assembly become hot during installation of the strain relief sleeve. To prevent burns, allow tools and D-621 connector to cool before handling.

5.8 Rework of Braid Terminations

5.8.1 Rework of Underheated Braid Terminations

Reheat underheated braid terminations.

- Be sure to follow the procedures in Step 5 of Section 5.7.

5.8.2 Rework of Overheated, Damaged, or Incorrectly Positioned Braid Terminations

1. Score the braid terminator sleeve full length with a sharp blade.

   - NOTE: Avoid cutting into the cable insulation.

   - **WARNING:** Safety glasses must be worn during the following heating operation to prevent danger to eyes from hot solder.

2. Hold the assembly with pliers or vice; heat the braid terminator until the solder melts, using one of the heating tools listed in Section 3.0; and pull off the hot sleeve with pliers.

3. Unsolder the braid strands from the D-621 connector body.

   - Use the same heating tool as in step 2.

4. Remove the contact from the D-621 connector.

   - Use the AD-1447 contact removal tool.

5. Straighten the braid strands and remove excess solder from the D-621 connector body.

6. Slide a new braid terminator over the cable and push it back out of the way.

   - Make sure that there is a strain-relief sleeve on the cable before installing the braid terminator.

7. Install the contact into the D-621 connector and terminate the braid.

   - Follow the complete procedure as described in Section 5.7.