

Termination of D-621 Right-Angle 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

1.0 Purpose and Scope

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

D-621-XXXXR	Connector body
DK-621-XXXXR	Connector kit
DK-621-XXXXRX	Connector kit
DK-621-XXXXRXX	Connector kit
D-602-0126	Pin contact
D-602-0127	Socket contact

2.0 References

AA-400 SuperHeater Instructions
CV-5300 MiniGun Instructions
CV-5700 MiniGun Instructions

3.0 Tools

AA-400 SuperHeater hot air heater with mini SolderSleeve reflector
CV-5300 MiniGun hot air heater with MG-1 reflector
CV-5700 MiniGun hot air heater with MG-7 reflector (replaced by CV-5300)
AD-1319 holding fixture
AT-1319-14 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 with straight tip
AD-1464 contact removal tool with flexible tip
AD-1480 repair holding fixture
CV-1980 and CV-1981 infrared heaters (Europe only)

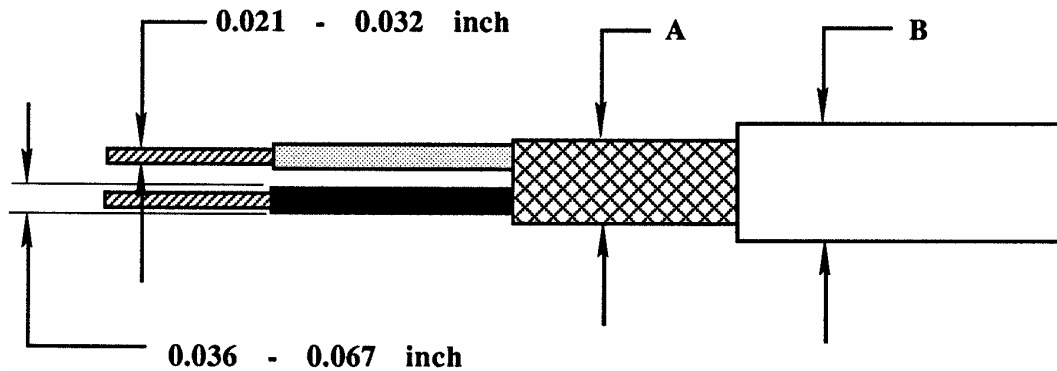
4.0 Materials

Solder: Type Sn63 per QQ-S-571
Flux: Type RMA per MIL-F-14256 (Alpha No. 611)
Removable thread
locking sealant: Loctite Number 242 or equivalent

5.0 Cable Termination Procedure

5.1 Cable Accommodation

D-621 right-angle connectors will accommodate solderable, twinaxial cables with dimensions shown in Figure 5-1, or Raychem part numbers shown in Table 5-1.



For D-621-OXXX

A = 0.130 max.

B = 0.148 max.

For D-621-1XXX

A = 0.160 max.

B = 0.180 max

Figure 5-1. Twinaxial Cable Accommodation for D-621 Right-Angle Connectors

**Table 5-1.
Raychem Twinaxial Cables for D-621 Right-Angle Connectors**

D-621 Connector Series	Raychem Twinaxial Series
D-621-OXXX (small diameter)	6329
	10595
	10602
	10606
	10612
D-621-1XXX (large diameter)	6499
	10605
	10613
	10614

5.2 Twinaxial Cable Preparation

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

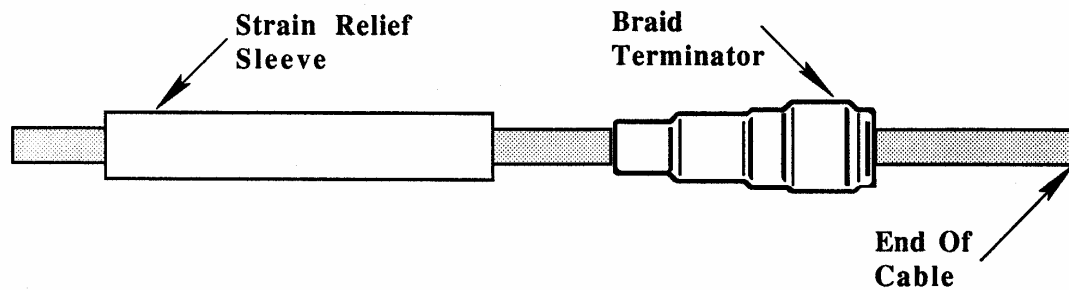


Figure 5-2. Sliding Strain Relief Sleeve and Braid Terminator onto Cable

2. Strip the cable jacket as shown in Figure 5-3.

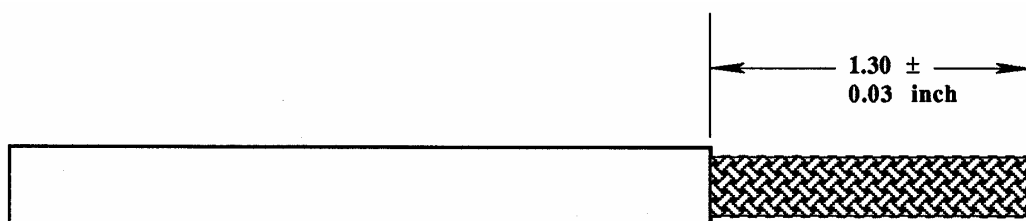


Figure 5-3. Cable Jacket Initial Stripping

3. Remove the exposed shield braid (Figure 5-4).



Figure 5-4. Shield Removal

4. Strip the cable jacket as shown in Figure 5-5.

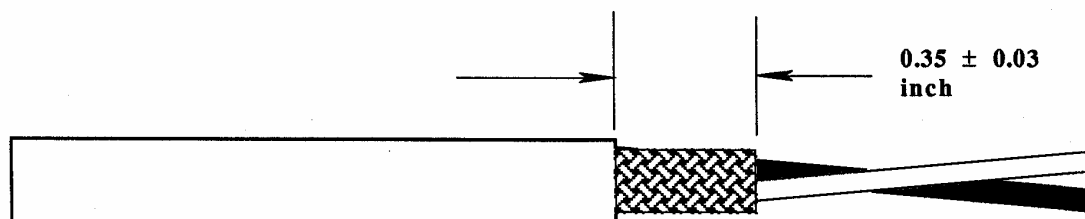


Figure 5-5. Cable Jacket Final Stripping

5. Comb out the Outer braid and fold it back over the jacket.
 - See Figure 5-6 for cable without inner braid
 - See Figure 5-7 for cable with inner braid.

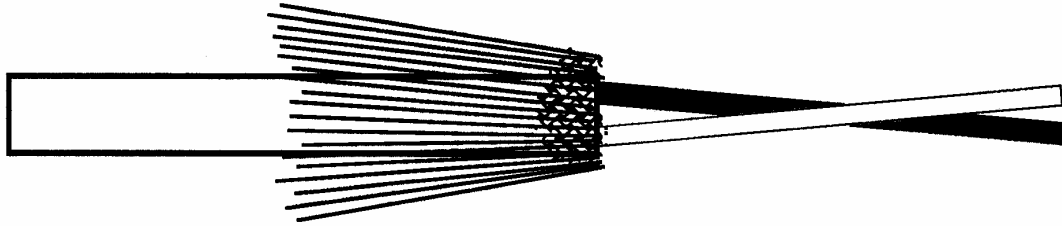


Figure 5-6. Outer Braid Preparation: Twinaxial Cable without Inner Braid

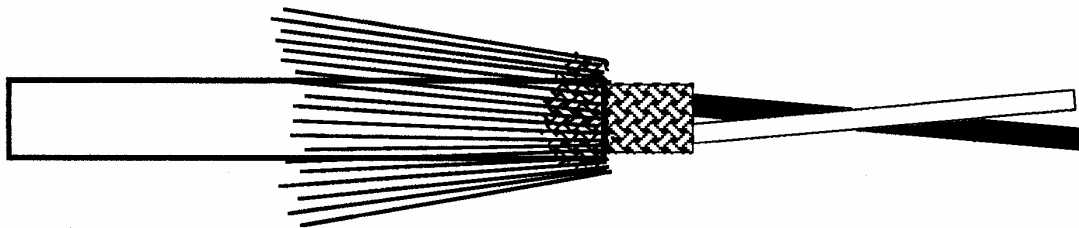


Figure 5-7. Outer Braid Preparation: Twinaxial Cable with Inner Braid

6. If Mu-metal tape is present, trim it as shown in Figure 5-8

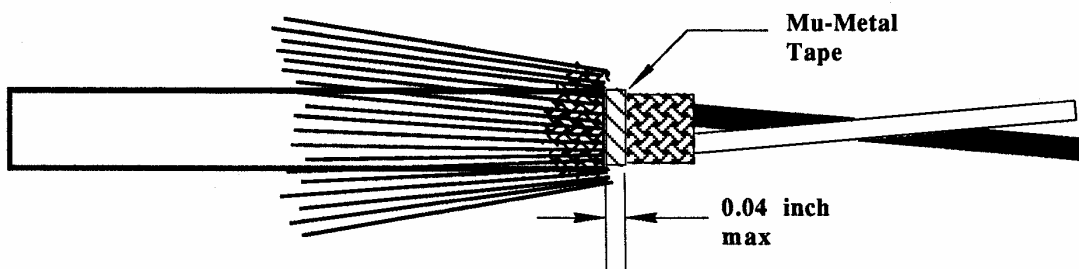


Figure 5-8. Mu-Metal Tape Preparation: Twinaxial Cable with Mu-Metal Tape

7. If inner braid is present, comb it out and fold it back over the jacket as shown in Figure 5-9.

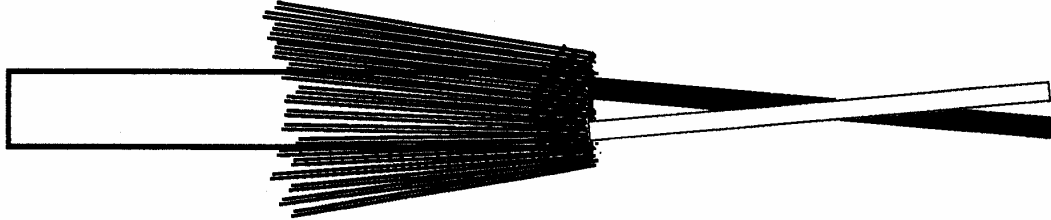


Figure 5-9. Inner Braid Preparation: Twinaxial Cable with Inner Braid

8. Remove any fillers to within 0.05 inch of the braid.
9. Straighten the twisted pair wires (Figure 5-10).

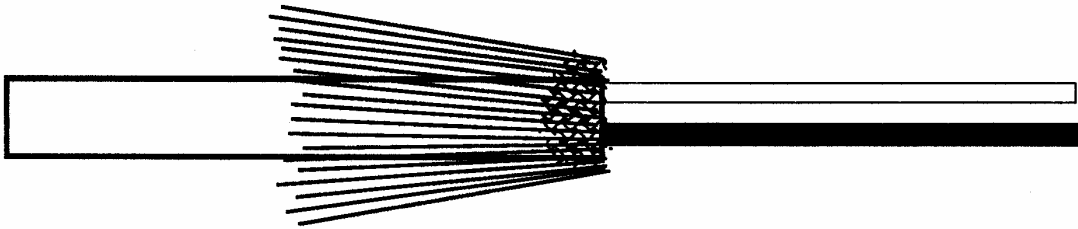


Figure 5-10. Twinaxial Cable Preparation: Conductors Ready to Strip

10. Strip the cable conductors to the dimensions shown in Figure 5-11.

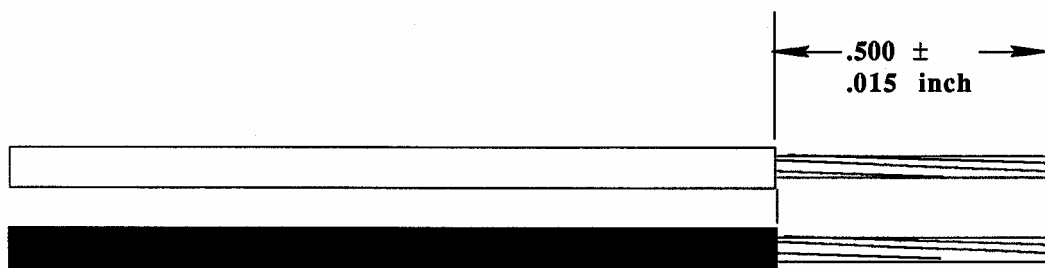


Figure 5-11. Cable Conductor Stripping Dimensions

11. Make sure that the conductor strands are twisted into their normal lay. Retwist and smooth the strands with fingers, if necessary.
12. Pretin 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 5-12).

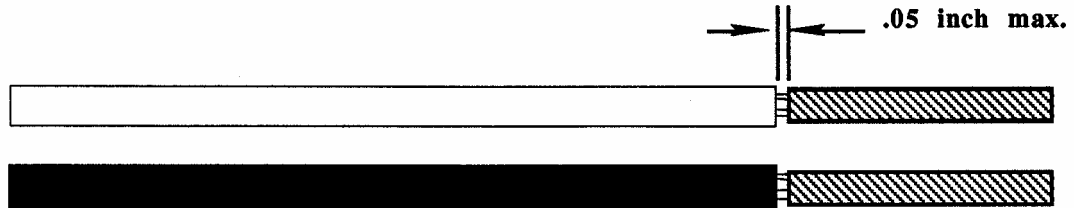


Figure 5-12. Pretinned Cable Conductors

13. Unless otherwise specified, trim the signal and ground conductors as shown in Figure 5-13.

- **IMPORTANT:** The wire color relationship to high and low signals must be maintained throughout the interconnection system. It is recommended that the white wire be the high signal (terminated to the center contact) and the blue wire be the low signal (terminated to the contact body).
- Use the AD-1297 conductor trimming tool for AWG 22 conductors.
- Use the AD-1298 conductor trimming tool for AWG 24 or 26 conductors.

14. Proceed to Section 5.3.

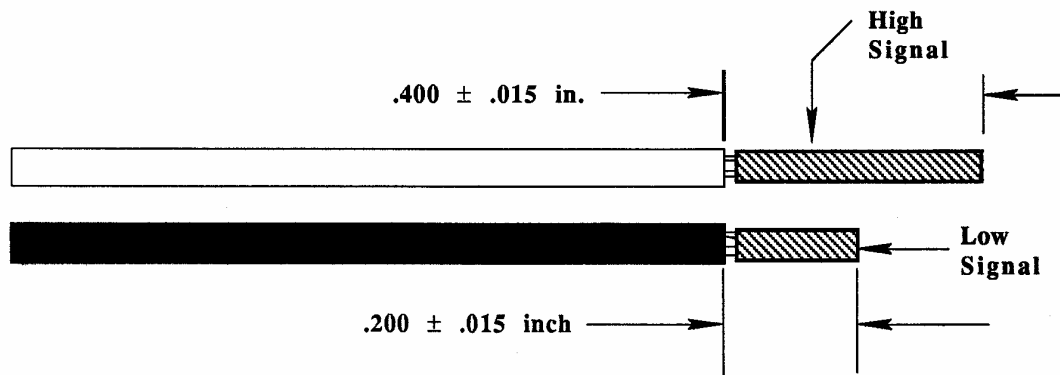


Figure 5-13. Cable Conductor Trimming Dimensions

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. Feed the primary wires through the right-angle adaptor (Figure 5-14).
 - A length of 3/32-inch plastic tubing can be fed through the adapter from the threaded end, and two wires then fed through the tubing. Withdraw the tubing after the wires are fully through the adapter.
 - Take care not to dislodge the rubber grommet in the threaded end of the right angle adaptor. If it becomes dislodged, be sure to reinstall it.
 - If tubing is not available, bend the tinned ends of the wires slightly (approx. 30 to 45 degrees) to make insertion easier. Be sure to straighten wires afterward.

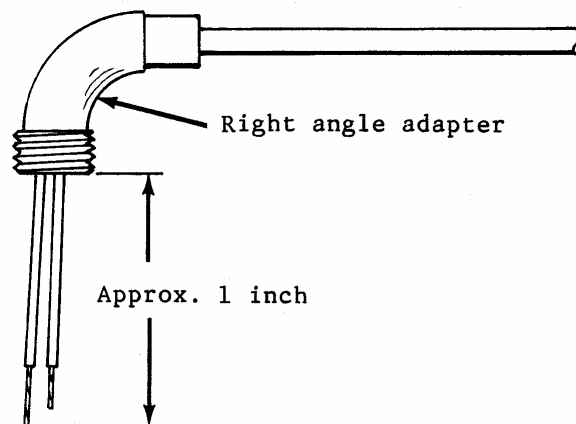


Figure 5-14. Primary Wires Inserted Through Right-Angle Adaptor

3. Start the cable conductors into the SolderTact contact as follows:
 - High Signal (longer) conductor into the inner (small diameter) insulating sleeve.
 - Low Signal (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).
4. Push both conductors into the contact until they are fully inserted.
 - While pushing the wires in, wiggle 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.

5. Inspect the wires for proper positioning inside the SolderTact contact (Figure 5-15).
 - The high 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 low signal 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 wire insulation must end outside of, and within 0.10 inch of, the contact body.

6. Proceed to Section 5.4

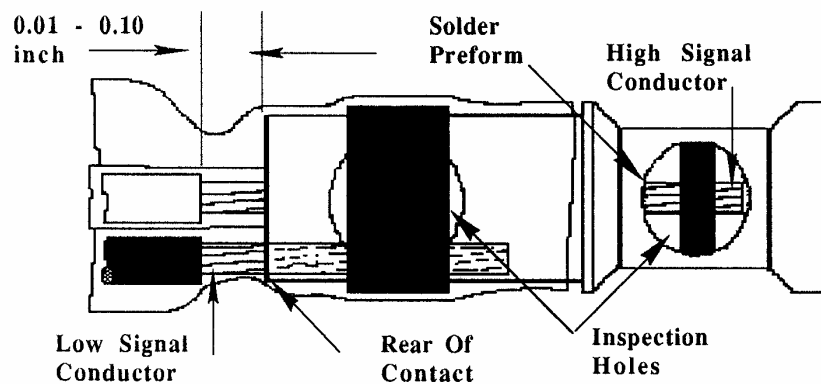


Figure 5-15. Inspection for Proper Cable Insertion

5.4 Heating Procedure

- **IMPORTANT:** For hot air termination, the AD-1480 repair holding fixture, **must** be used to prevent damage to the contacts.
1. Insert the contact/cable assembly into the appropriate end of the AD-1480 repair holding fixture (Figure 5-16).
 - D-602-0126 pin contact into "P" end of holding fixture.
 - D-602-0127 socket contact into "S" end of holding fixture.△



Figure 5-16. Contact/Cable Assembly Inserted into AD-1480 Holding Fixture (Outer Pin Contact Shown for Reference)

2. 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 before contacts are heated: 30 seconds for AA-400; 2 minutes for MiniGun.
 - Position the contact in the heating tool reflector as shown in Figure 5-17, 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.
 - **IMPORTANT:** Allow the solder to solidify before disturbing the contact or cable.

3. Inspect the completed termination (see Section 6.0).

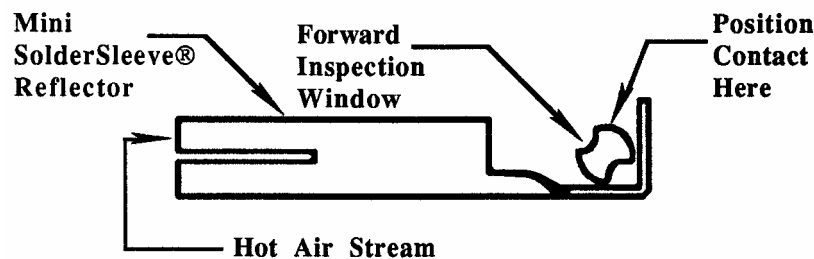


Figure 5-17A. Contact Positioning in AA-400 Mini-SolderSleeve® Reflector

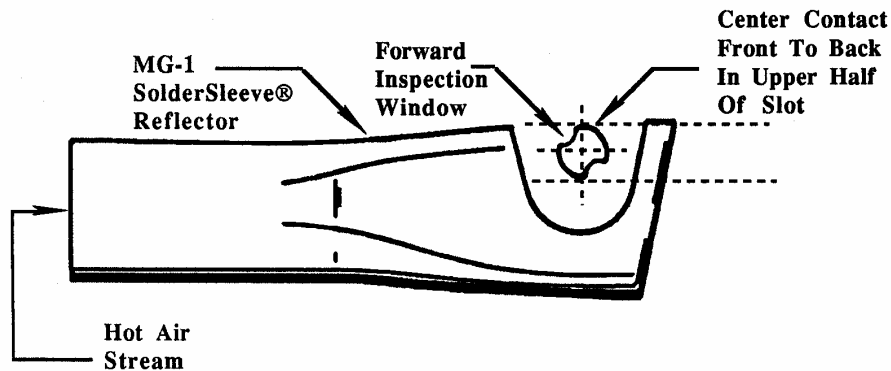


Figure 5-17B. Contact Positioning in MiniGun® MG-1 Reflector

6.0 Inspection of Terminated Contacts

6.1 Inspection for Correct Assembly.

Inspect the completed termination for correct assembly as follows:

- The high 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 low signal wire insulation shall not exceed 0.13 inch (Figure 6-1).
- The low signal wire insulation shall not extend into the contact body.
- The low signal 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.

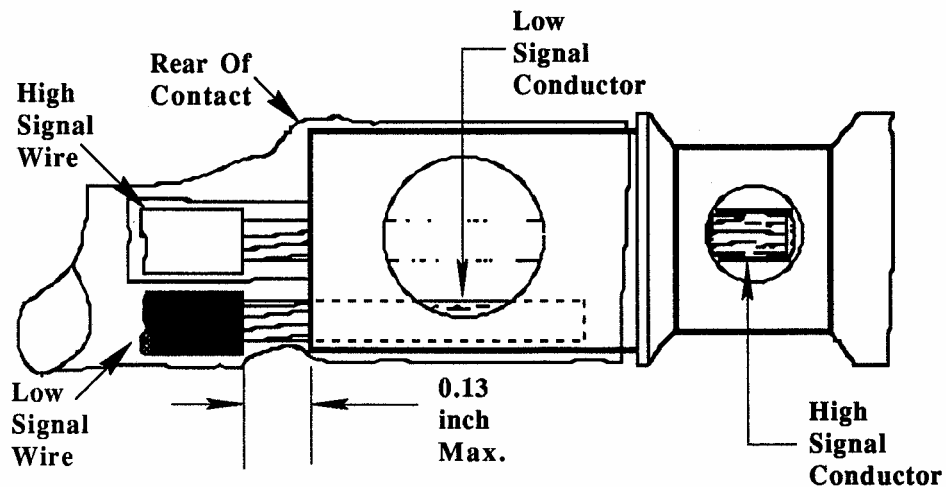


Figure 6-1. Inspection for Proper Assembly

6.2 Inspection for Proper Heating

1. The solder in the inspection windows near the middle of the contact must have melted and flowed so that the original ring shape of the preform has disappeared, and a solder fillet is visible between the high 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 a solder fillet indicates overheating.
2. The solder in the inspection windows near the rear of the contact must have melted and flowed into the contact through the rear inspection windows, and a solder fillet must be visible between the low signal conductor and the rear of the contact body (Figure 6-2).
 - 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 a solder fillet indicates overheating.

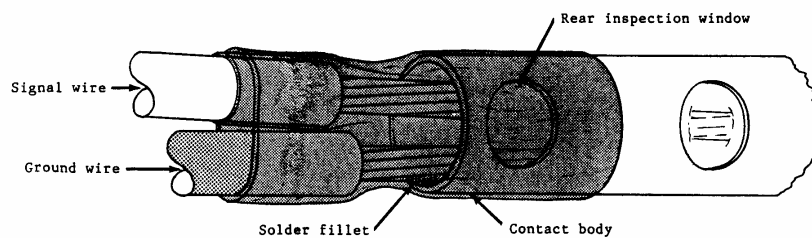


Figure 6-2. Solder Fillet Between Ground Conductor And Contact Body

3. The insulating sleeves must be shrunk over the exposed conductor between the wire insulation and the contact; complete shrinking of sleeves is not necessary at the end over the wire insulation, unless required to fit into the connector grommet.
 - The insulating sleeves may remain flared at the end over the wire insulation.
4. The insulating sleeves must not be darkened so as to prevent visual inspection of the solder joints.
 - 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.
 - Slight darkening of the insulation is acceptable.

7.0 Repair and Rework of Terminated Contacts.

7.1 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 Section 6.0.

7.2 Overheated or Improperly Assembled Terminations.

1. Remove the contact from the cable as directed in Paragraph 7.3.
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 5-11).
3. Install a new contact (Paragraphs 5.3, 5.4 and Section 6.0).

7.3 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.
 - **IMPORTANT:** 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 melts.

8.0 Installing Terminated Contacts Into D-621 Right-Angle Connectors.

1. Insert the terminated SolderTact contact into the rear of the D-621 connector body until the retention clips lock the contact in place. (Figure 8-1)
 - Contacts can be removed from D-621 connectors using the AD-1447 or AD-1464 removal tool.

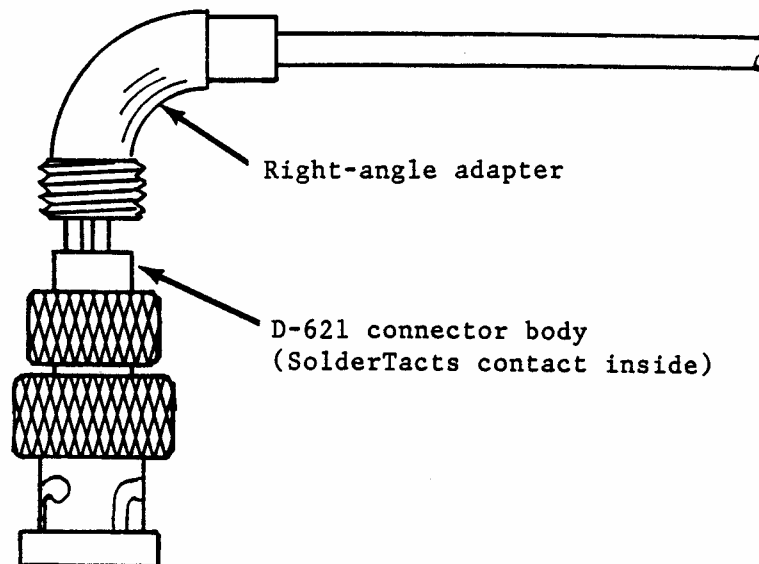


Figure 8-1. Contact Installed in D-621 Connector Body.

2. Slide the cable back through the right-angle adapter until the end of the connector body slips into the right-angle adapter (Figure 8-2).

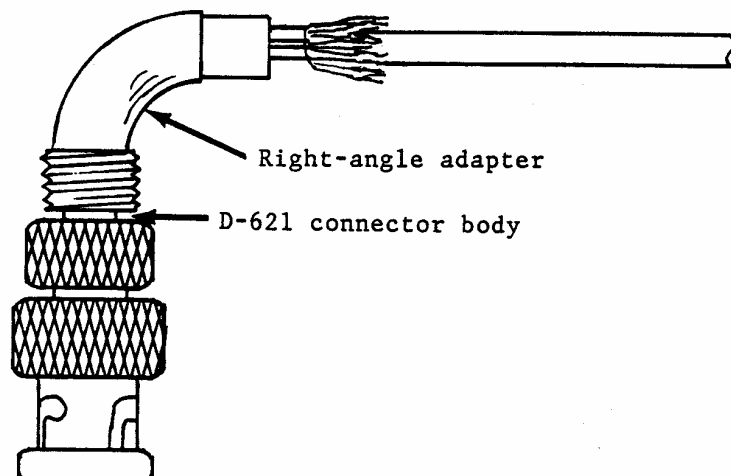


Figure 8-2. End of Connector Body Positioned In Right-Angle Adapter

3. Connect the right-angle adapter to the connector body with the coupling ring, but do not tighten.
 - The right-angle adapter will be oriented and the coupling ring tightened when the D-621 connector is mated.
4. Dress the cable braid over the rear of the right-angle adapter (Figure 8-3).

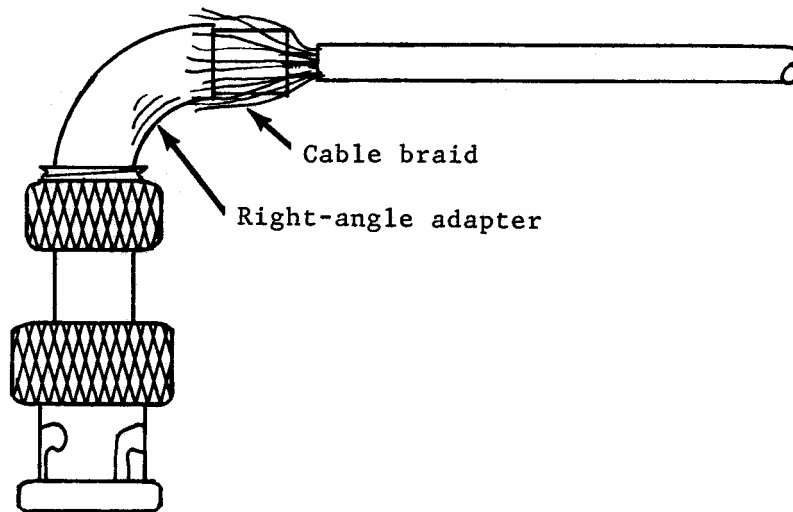


Figure 8-3. Cable Braid Pulled Forward Over Right-Angle Adapter

5. Trim the cable braid as shown in Figure 8-4.

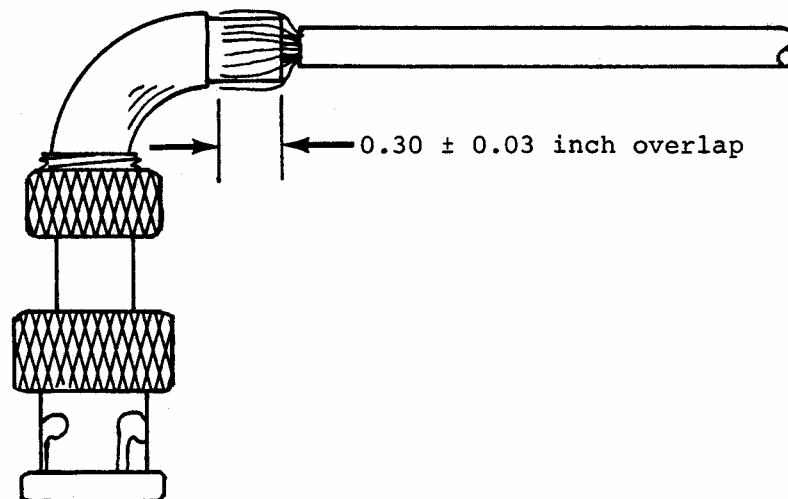


Figure 8-4. Trimming Dimension For Cable Braid

- Slide the braid terminator over the rear of the right-angle adapter and over the braid, until it bottoms against the right-angle adapter (Figure 8-5).

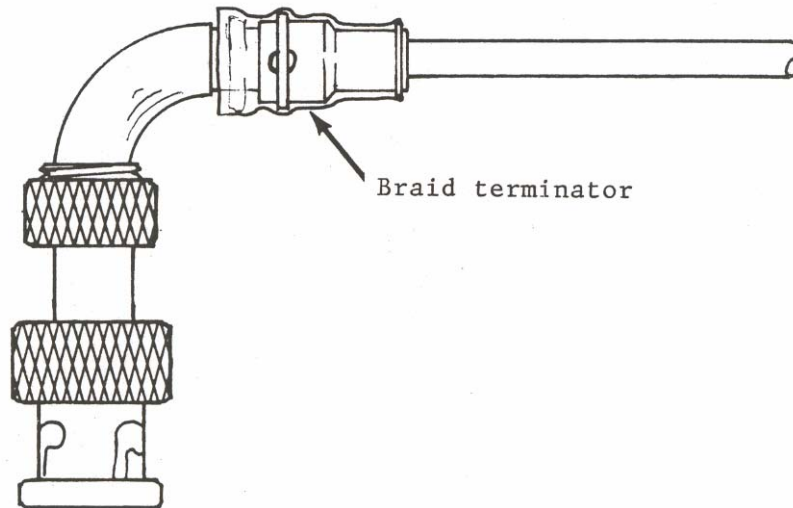


Figure 8-5. Braid Terminator Positioned Over Rear of Right-Angle Adapter

7. Heat the braid terminator to solder the braid and shrink the insulation sleeve.
 - The AD-1564 connector support tool must be used to fixture the D-621 connector during heating; otherwise, damage to the D-621 connector will result. Insert the tool into the mating end of the D-621 connector before heating, and remove it after the connector has cooled.
 - Use either the AA-400 SuperHeater with the Mini SolderSleeve reflector or the CV-5300 MiniGun with the MG-1 reflector.
 - 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 8-6, and begin heating at the end of the braid terminator next to the right-angle adapter.
 - Heat until the solder melts, flows and wets to the braid strands and right-angle adapter body. Heat the rest of the braid terminator until the sleeve shrinks onto the cable and right-angle adapter. 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 components to cool before handling.

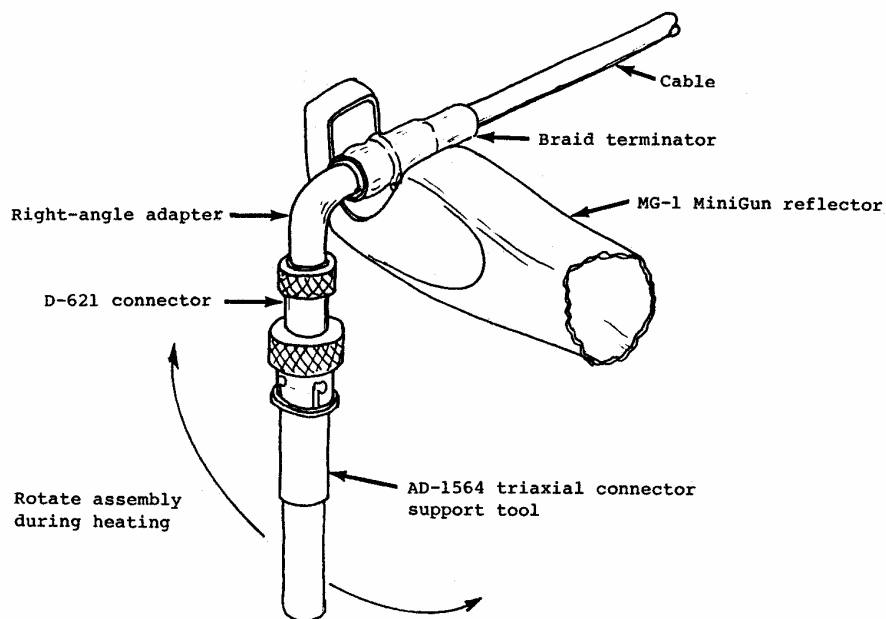


Figure 8-6. Heating the Braid Terminator

8. Visually inspect the braid termination as follows:
 - Positioning: The braid must overlap the body of the right-angle adapter at least 0.20 inch.
 - Heating: The solder must have melted, flowed and wetted to the braid strands and right-angle adapter. 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 Section 9.0.
9. Slide the strain relief sleeve over the braid terminator and position it against the D-621 connector as shown in Figure 8-7.

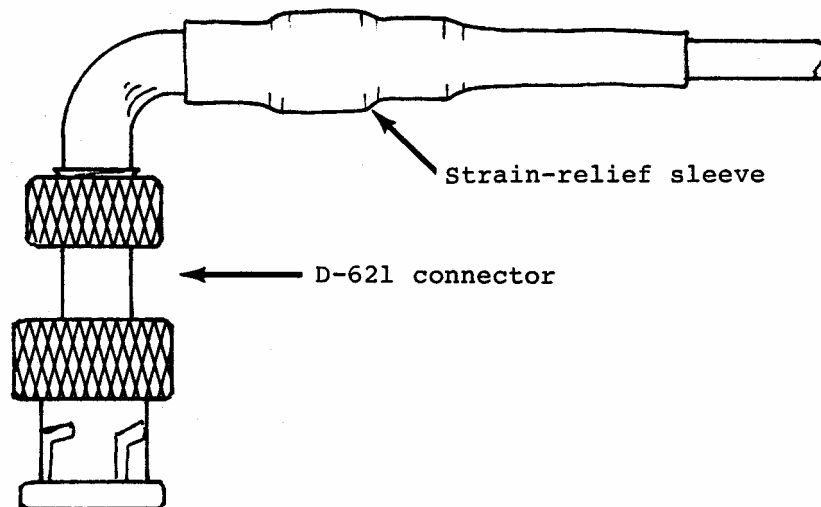


Figure 8-7. Position Of Strain Relief Sleeve

10. 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 components to cool before handling.

9.0 Rework of Braid Terminations

9.1 Rework of Underheated Braid Terminations.
Reheat underheated braid terminations.

- Be sure to follow the procedures in Step 7 of Section 8.0.

9.2 Rework of Overheated, Damaged, or Incorrectly Positioned Braid Terminators.

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

- **IMPORTANT:** 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, heat the braid terminator until the solder melts, and pull off the hot sleeve with pliers.

- Use one of the heating tools listed in Section 3.0.

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

- Use one of the heating tools listed in Section 3.0.

4. Unscrew the coupling ring.

5. Remove the contact from the D-621 connector using the AD-1447 or AD-1464 removal tool.

6. Remove the contact from the cable as directed in Paragraph 7.2. and 7.3.

7. Remove the right-angle adapter from the cable.

8. Straighten the braid strands and remove excess solder from the right-angle adapter body.

- Use one of the heating tools listed in the Section 3.0. Heat until solder melts and remove excess solder.

9. 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.

10. Install a new contact on the cable (Paragraphs 5.3 and 5.4 and Section 6.0).

11. Install the contact into the D-621 connector body and terminate the braid as directed in Section 8.0.

10.0 Cable Dressing and Connector Mating Procedure

1. Make sure that the coupling ring is slightly loose, so that the right-angle adapter can be turned with respect to the connector body.
2. Orient the right-angle adapter and cable to the approximate required position, and mate the D-621 connector to the mating jack connector.
3. Adjust the right-angle adapter and cable to the required position.
4. Apply a drop of removable thread locking sealant (Loctite Number 242 or equivalent) to the threads for the coupling ring.
5. Tighten the coupling ring finger tight.
 - Allow the sealant to cure for the time recommended by the manufacturer.