Termination Procedure for Size 12, Series "999" SolderTact™ Contacts for Twisted Pair Cable: D-602-0146, -0147

1. Purpose and Scope

This standard contains the termination procedures, inspection requirements, and rework procedures for the following Raychem SolderTact contacts for twisted-pair cable:

- D-602-0146 size 12 pin contacts for MIL-DTL-38999 Series I, II, III, and IV connectors.
- D-602-0147 size 12 socket contacts for MIL-DTL-38999 Series I, III, and IV connectors.

2. References

The following Raychem documents are referenced in this engineering standard:

- AA-400 Superheater Instructions.
- AD-1319 Holding Fixture Instructions.
- HL2020E Steinel Hot-Air Heating Tool Instructions.
- Visual Inspection Standards: Verification Photos.

3. Application Equipment and Tools

3.1 Holding Fixtures and Adapters

- AD-1319 holding fixture.
- AD-1567 holding fixture.
- AD-1566 repair holding fixture.
- AT-1319-24 adapter for use with AD-1319 and AD-1567 fixtures.

3.2 Heating Tools

- AA-400 SuperHeater with No. 979663 Mini -SolderSleeve reflector.
- HL2020E Steinel Hot-Air Heating tool with EH0600-000 HL SolderSleeve reflector.

  Note: Equivalent hot air tools may be used.

3.3 Miscellaneous Tools

- Raychem AD-1575 folding tool for twisted pair cable.

4. Materials

- Solder: Sn63 or Sn60 per ANSI-J-STD-006.

- Flux: Type RMA per ANSI-J-STD-004 (Alpha #611 or equivalent)

5. Termination Procedures

5.1 Twisted Pair Cable Accomodation

D-602-0146 and D-602-0147 SolderTact contacts can be terminated to twisted-pair cable of the following constructions:

Size	AWG 22 through AWG 26
Plating	Tin or silver
Construction	Solid or stranded
Insulation diameter	0.055 inch, maximum

Consult Raychem for information on termination of these SolderTact contacts to other twisted-pair cables.

5.2 Twisted Pair Cable Preparation

1. Untwist and straighten the wires for a length of approximately 1.5 inch (Figure 5-1).

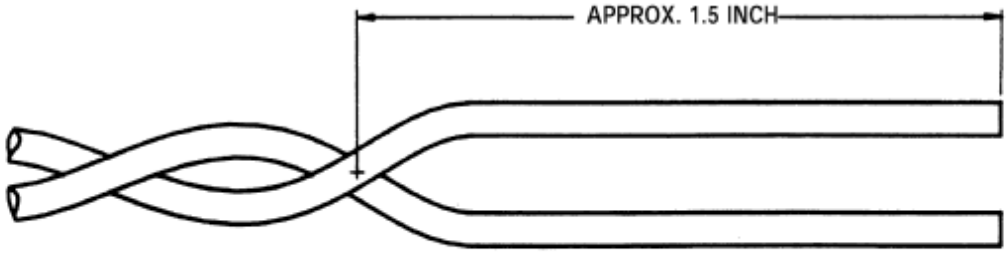


Figure 5-1. Untwisting and Straightening Twisted-Pair Cable

2.z Strip the cable to the dimensions shown in Figure 5-2.

- The insulation on the two conductors must be stripped to the same length within 0.030 inch.

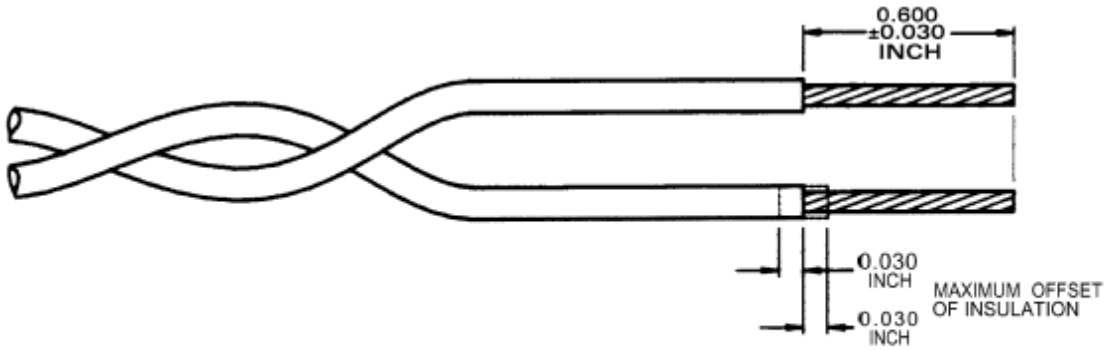


Figure 5-2. Cable Stripping Dimensions

3. Make sure that stranded conductors are twisted into their normal lay.

   - Retwist and smooth the strands with fingers, if necessary.

4. Pretin the stranded wires to within 0.05 inch of the insulation, using Sn63 solder per ANSI-J-STD-006 (Figure 5-3).

   - Use RMA flux per ANSI-J-STD-004 (Alpha #611 or equivalent).

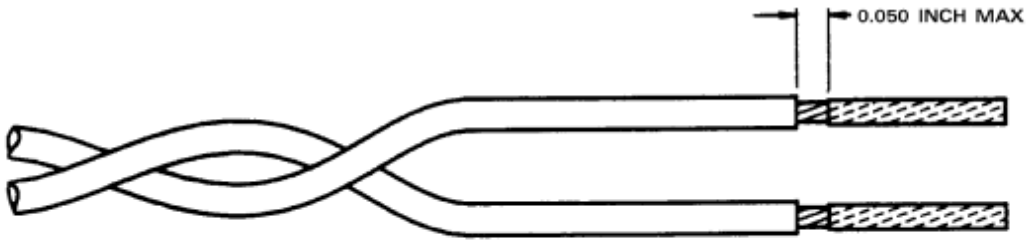


Figure 5-3. Pretinning Wires

5. Trim the cable conductors as shown in Figure 5-4

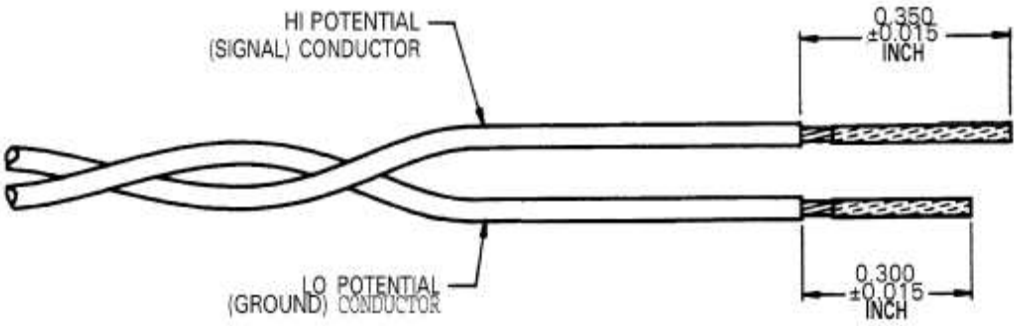


Figure 5-4. Trimming Dimensions for Twisted Pair Cables

6 Fold the LO potential (ground) conductor back in a loop as shown in Figure 5-5.

- Use the AD-1575 conductor folding tool. Insert the conductor fully into either one of the small holes in the tool, and fold the conductor back into the groove.
- IMPORTANT: Be sure to push the conductor fully into the groove of the folding tool.

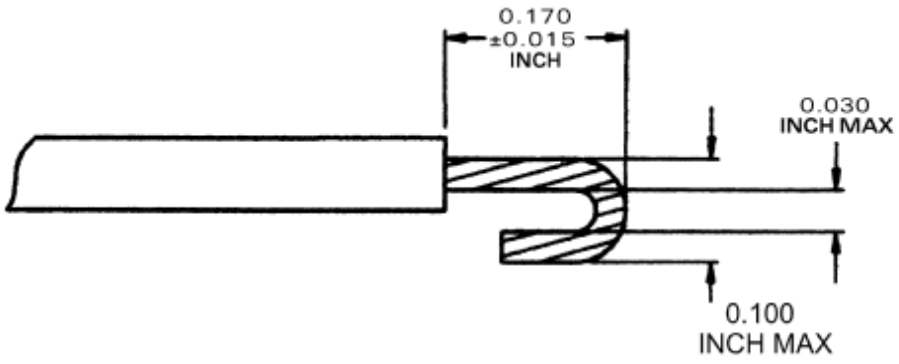


Figure 5-5. Folding Dimensions for LO Potential (Ground) Conductor

5.3 Inserting Prepared Cable Into Contact

1. Make sure that the end of the HI potential or signal conductor (long strip length) is straight, and that the LO potential or ground conductor is folded as directed in step 6 above.

2. Start the conductors into the contact as follows:

   a. Guide the HI potential or signal conductor (long strip length) into the inner insulating sleeve.

   b. Guide the LO potential or ground conductor (folded) between the two insulating sleeves, along the side of the contact that will be nearest the heat source when the contact is heated.

3. Push both conductors into the contact until they are fully inserted as shown in Figure 5-6.

   - While pushing the conductors in, rotate the contact slightly back and forth to prevent the conductors from catching.

   - Do not force or twist the signal conductor after it is fully inserted.

   - If the conductors cannot be positioned correctly, remove them and check for improper strip dimensions, splayed or bent conductors, and excess solder on conductors.

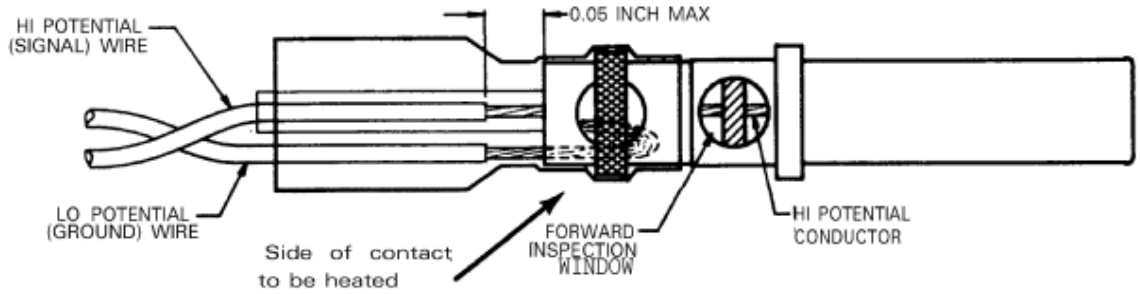


Figure 5-6. Inserting Twisted Pair Conductors Into Contact

6. Heating Procedures

6.1 Holding Fixture and Adapter Selection

Select the appropriate holding fixture and adapter for the contact to be terminated (Table 6-1).

- IMPORTANT: A suitable holding fixture must be used, to prevent damage to the contacts.

- AD-1566 repair holding fixture is designed for use during the replacement of contacts where limited access prevents the use of the AD-1319 or AD-1567 fixtures. The AD-1566 repair holding fixture does not provide cable clamping; therefore the cable must be secured during heating to prevent faulty solder terminations.

Table 6-1. Holding Fixture and Adapter Selection

CONTACT	STANDARD HOLDING FIXTURE		REPAIR HOLDING FIXTURE
	BASIC FIXTURE	ADAPTER	
D-602-0146 D-602-0147	AD-1319 or AD-1567	AT-1319-24	AD-1566

6.2 Holding Fixture Setup

6.2.1 Setup Procedures for AD-1319 Holding Fixture.

1. Install the AT-1319-24 adapter onto the AD-1319 holding fixture (See Figure 6-1).

2. Insert a contact in the adapter and set up the dimensions as shown in Figure 6-1.

   - Make sure that the contact is inserted in the appropriate end of the adapter:

     a. D-602-0146 outer pin contacts in the “P” end.

     b. D-602-0147 outer socket contacts in the “S” end.

   - If using a hot-air heating tool, the spacer collar is not needed, but may be left in place.

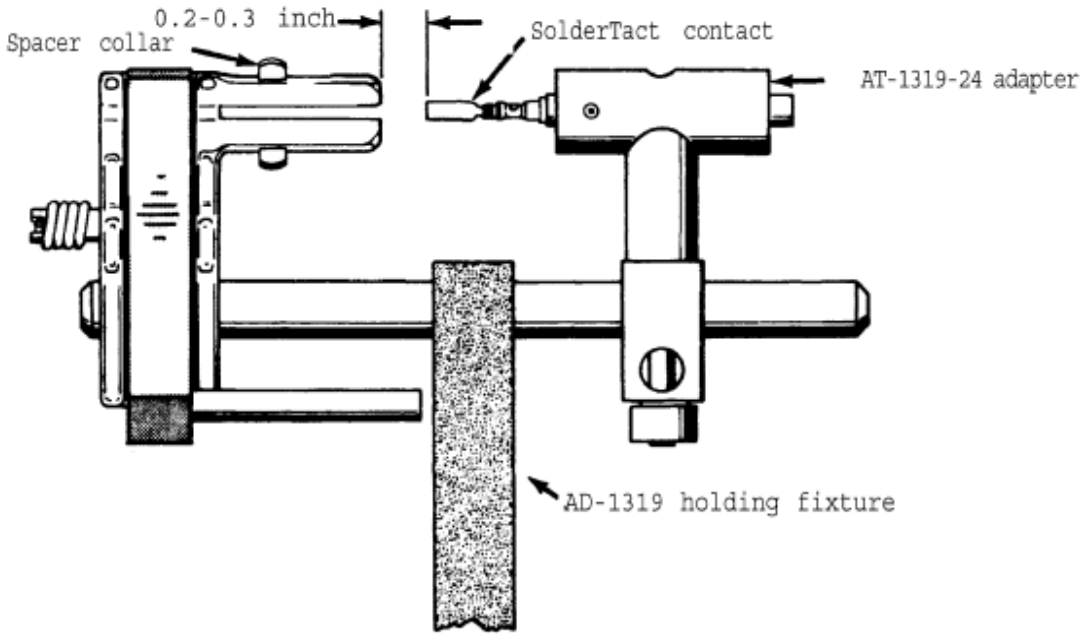


Figure 6-1. Setup Dimensions for AD-1319 Holding Fixture

6.2.2 Setup Procedures for AD-I567 Holding Fixture

1. Install the AT-1319-24 adapter onto the AD-1567 holding fixture (See Figure 6-2).

   - If installing an adapter for the first time, it is necessary to separate the cylindrical parts of the adapter from the rectangular mounting base. The rectangular base is not used with the AD-1567 holding fixture,

   - Be sure to install two collars, one above and one below the AD-1567 body.

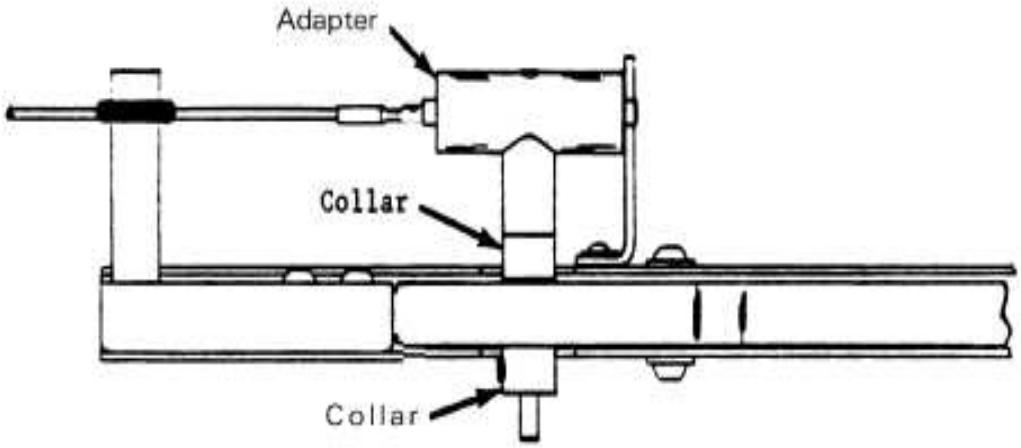


Figure 6-2. Adapter Installation on AD-1567 Holding Fixture

6.3 Heating Procedure.

1. Insert the contact/cable assembly into the appropriate end of the adapter (Figure 6-3) or repair holding fixture (Figure 6-4).

   a. D-602-0146 outer pin contacts in the “P” end.

   b. D-602-0147 outer socket contacts in the “S” end.

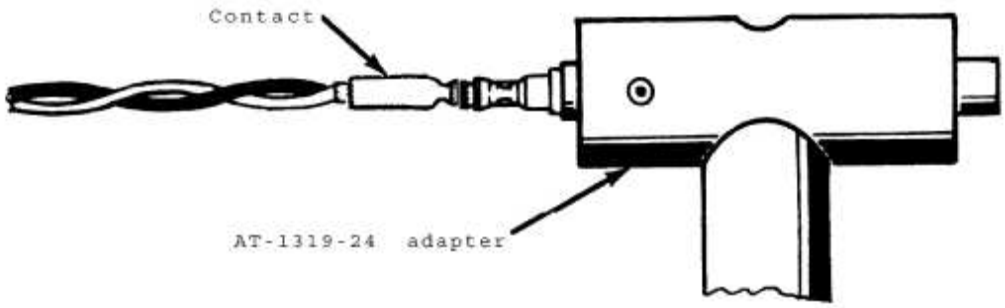


Figure 6-3. Contact Inserted into AT-1319-24 Adapter

Figure 6-4. Contact Inserted into AD-1566 Repair Holding Fixture

2. Clamp the cable in the AD-1319 or AD-1567 holding fixture (if used)
   - The cable must remain fully inserted in the contact.
   - The contact must be fully inserted in the adapter.
   - The cable must be straight between the contact and the cable clamp.
   - The folded ground conductor may be visible through either one of the inspection windows, and should be positioned against the downward facing side of the contact, as shown in Figure 6-5.

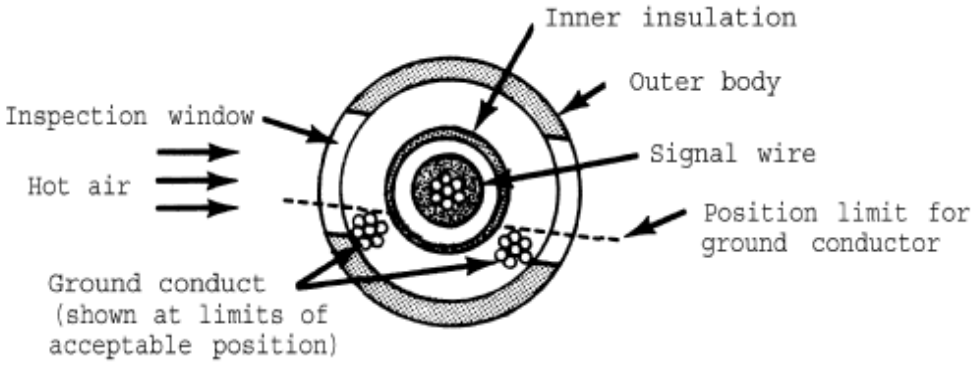


Figure 6-5. Position of Ground Conductor in Contact (Cross Section View)

3. Attach the appropriate reflector and other applicable accessories to the heating tool.
   - For AA-400 SuperHeater: No. 979663 Mini-SolderSleeve reflector (required).
   - For HL2020E: EH0600-000 HL SolderSleeve reflector.

4. Turn the heating tool on and allow to warm up. (See instructions for tool used).
   - Steinel settings: 700°F ± 50°F, setting Air Flow Stage II, Duration-20 to 30 Secs

CAUTION
The heating tools have hot nozzle surfaces and produce hot air that can cause burns. To prevent burns, do not touch the nozzle, and keep hands and fingers away from the hot air stream.

5. Heat the contact as follows:
   a. Using the holding fixture, position the contact in the heating tool reflector as shown in Figure 6-6, with the forward inspection window centered in the reflector, the inspection windows aimed for good visibility, and the side with the ground conductor facing down.

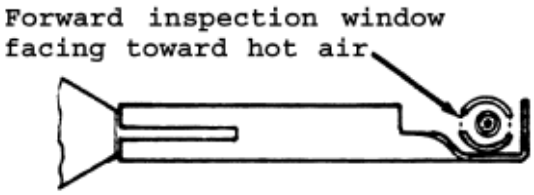
   b. Continue heating until the small solder preform in the forward inspection window has melted and flowed. The large solder preform in the rear inspection window should have melted and flowed by this time; if it has not, direct hot air at the rear inspection window until it does.

      - If contact is UNDERHEATED, there will be visible remnants of the original shapes of the solder preforms. An under-heated contact must be reheated as directed in 8.1.

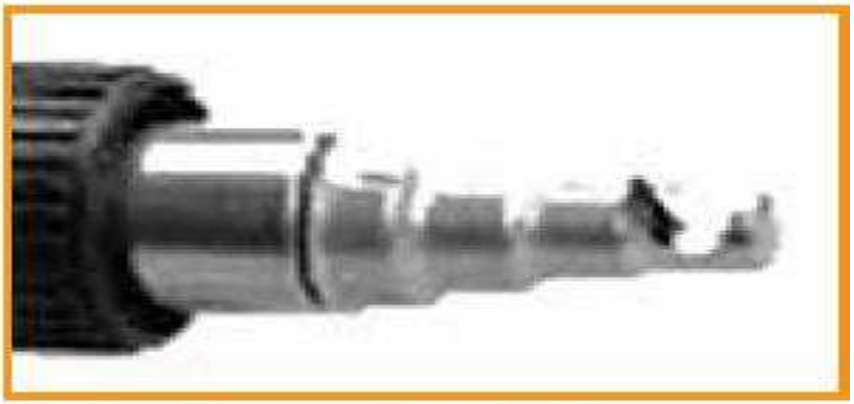
      - If contact is OVERHEATED, solder will wick away from the joint areas, leaving no solder fillets. An overheated contact must be removed and a new contact installed as directed in 8.2.

6. After the contact has cooled for at least 10 seconds, remove the contact and cable from the holding fixture.

7. Inspect the completed termination according to Section 7.0.



MINI SOLDERSLEEVE REFLECTOR FOR AA-400 SUPERHEATER



HL Steinel Reflector for HL2020E Steinel Heating Tool

Figure 6-6. Contact Position in Heating Tool Reflector

7. Inspection

If contacts are underheated, overheated, or improperly assembled, they must be reworked as directed in Section 8.0.

7.1 Inspection for Proper Assembly

Inspect the completed termination for correct assembly according to the following criteria:

1. The distance from the rear end of the contact body to the wire insulation must not exceed 0.05 inch.

2. The HI potential (signal) conductor must be visible through one of the forward inspection windows.

3. The LO potential (ground) conductor must be soldered to the inside surface of the contact body. The conductor may be visible through one of the inspection windows.

7.2 Inspection for Proper Heating

Inspect the completed termination for proper heating according to the following criteria:

1. The solder preform in the forward inspection windows must be melted and flowed so that:
   a. No trace of any original preform shape remains.

      - Any remaining preform shape indicates underheating.

b. Solder fillet is visible between the HI potential (signal) conductor and inner contact soldering surface.

- Insufficient visible solder indicates overheating.

2. The solder preform in the rear inspection window must be melted and flowed so that:
   a. No trace of original preform shape remains.

   - Any remaining preform shape indicates underheating.

   b. Solder preform has flowed into the contact through the rear inspection window.

3. The insulating sleeve must be fully shrunk onto the wires at the rear of the contact.

4. The insulating sleeve must not be darkened so as to obscure the solder joints or hinder inspection.

   - If the solder joints cannot be seen due to darkening of the sleeve material, the termination is overheated.

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

8. Repair and Rework

8.1 Underheated Terminations

Reheat underheated areas as directed in Section 6.0 and reinspect per Section 7.0. Avoid reheating areas that have been properly heated.

8.2 Overheated or Improperly Assembled Terminations

1. Remove the contact from the cable as directed in Paragraph 8.3.

2. Check the cable for damage and incorrect stripping.

   - If the cable is damaged, cut off the damaged portion and restrip as described in Section 5.0.

3. If stripping is incorrect, restrip as required (Section 5.0).

4. Install new contact (Sections 5.0, 6.0, 1.0).

8.3 Removing Contact From Twisted Pair Cable

1. Use a sharp knife or razor blade to score the outer insulating sleeve full length on two opposite sides of the contact.

   - Avoid cutting into wire insulation.

2. Peel off the outer insulating sleeve.

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

CAUTION
Safety glasses must be worn during the following operation. Hot solder can fly off the wires and cause burns to unprotected eyes.

4. Holding the contact with pliers, heat the contact until the solder melts, and quickly pull the heated contact off the cable.