Raychem INTERCONNECTION SYSTEMS ENGINEERING STANDARD	TITLE TERMINATING MTC50 CONNECTOR INSERTS TO FLAT CONDUCTOR CABLES: WIU TO WIU (G.E. CASS PROGRAM)	NUMBER ES-71064

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ES-71064

TERMINATING MTC50 CONNECTOR INSERTS TO FLAT CONDUCTOR CABLES: WIU TO WIU (G.E. CASS PROGRAM)

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1.0 PURPOSE AND SCOPE

This engineering standard covers the procedures for terminating single layers and dual layers of flat conductor cable (FCC) to MTC50 connector inserts. These procedures are applicable to the following components:

MTC50 connector inserts:

MTC50-EA2-P12	2-inch A pin insert
MTC50-EB2-P12	2-inch B pin insert
MTC50-EA2-S12	2-inch A socket insert
MTC50-EB2-S12	2-inch B socket insert

Flat conductor cable:

TU-40-050-28B	28 gauge, 40-conductor, 0.050-inch centers, 2-inch width
TU-20-050-28B	28 gauge, 20-conductor, 0.050-inch centers, 1-inch width

Wraparound shielding for 2-inch FCC: CHA-0129

Meltable sealant: CTA-0055, 2-inch width

Busbar: CTA-0103

2.0 REFERENCES

2.1 Raychem Instructions.

ES-61402: Instructions for CE-1404200 Waffle Iron II Heating Tool
ES-61112: Instructions for CE-1402400 folding tool for FCC
ES-61113: Instructions for CE-1400600 stripping tool for FCC

3.0 TOOLS

CE-1404200 Waffle Iron II Heating Tool

Platen sets for CE-1404200:

CE-1513700	For pin inserts and one 28-ga. cable layer, MTC50
CE-1513600	For socket inserts and one 28-ga. cable layer, MTC50
CE-1514700	For pin inserts and two 28-ga. cable layers, MTC50
CE-1516700	For socket inserts and two 28-ga. cable layers, MTC50

CE-1400600	Flat conductor cable stripping tool
CE-1402400	Flat conductor cable folding tool
CE-1401000	Insertion tool for 2-inch, 28-gauge flat conductor cable
CE-1201900	Insert removal tool, metal
D-659-0001	Insert removal tool, plastic

Solder pot

Phillips Screwdriver, #1

966034 Carpenter Model 95A flat cable cutter.

Paper cutter (optional)

Scissors

Microscope

4.0 MATERIALS

Solder: Sn63 or Sn60 per QQ-S-571

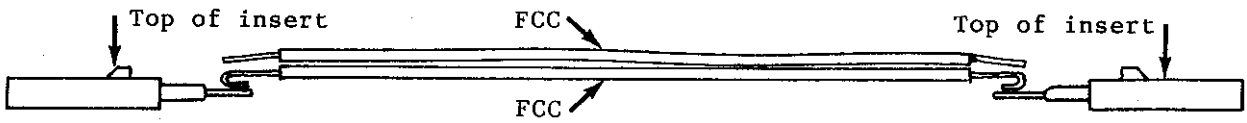
Flux: Type RA per MIL-F-14256 (Kester #1544)
Type RMA per MIL-F-14256 (Alpha #611)

Flux thinner: Kester #104 for Kester #1544 flux
Isopropyl alcohol for Alpha #611 flux

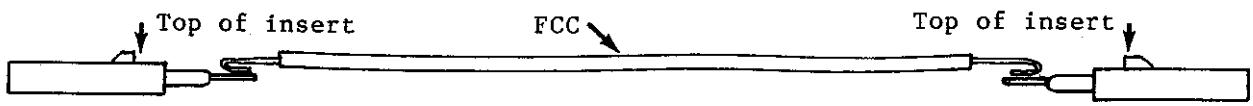
Flux remover: Isopropyl alcohol

5.0 TERMINATION PROCEDURES

These procedures are for terminating flat conductor cable (FCC) to 2-inch MTC50 connector inserts in accordance with Raychem drawings 2034AS503 and 2034AS504. Connector inserts may be terminated to a single layer, 1-1/2 layers, or two layers of FCC. Figure 5-1 illustrates the orientation of the FCC's and connector inserts.



1-1/2 OR 2 LAYER ASSEMBLY



SINGLE LAYER ASSEMBLY

Figure 5-1. Harness Component Orientation (For Reference)

5.1 Flat Conductor Cable (FCC) Preparation.

1. Cut the FCC to the length required.
   - o Cable length is the harness length on Raychem drawing 2034AS503 or 2034AS504 minus 1.4 inches.
   - o Cable must be cut square and cleanly without bending the ends.
   - o Cutting tool: 966034 Carpenter Model 95A flat cable cutter.
2. Strip the cable insulation 0.30 ± 0.01 inch at both ends.
   - o Stripping tool: CE-1400600 flat cable stripper.
3. If there are two layers of FCC to be terminated to one connector insert, prepare both pieces of FCC as described in Steps 1 and 2, and then trim one piece to a strip length of 0.20 ± 0.01 inch at both ends.
   - o This piece with the 0.20-inch strip length will be the "non-folded" FCC. The piece with the 0.30-inch strip length will be the "folded" FCC.

4. Flux the exposed conductors for half to three quarters of their exposed length.

   - Dip the conductors in type RA flux (Kester #1544 or equivalent) diluted 1:1 with flux thinner (Kester #104 thinner for Kester #1544 flux).

5. Allow fluxed conductors to dry at least 30 seconds.

6. Pretin the exposed conductors by dipping them in molten Sn60 or Sn63 solder.

   - Solder temperature: 500 ± 20°F.
   - Skim dross from solder in pot.
   - Immerse conductors for 4 to 6 seconds, and withdraw slowly to prevent icicle formation.

7. Remove flux residue using isopropyl alcohol.

   - Wipe from the insulation toward the tips to prevent conductor damage

WARNING
Isopropyl alcohol is a volatile, flammable liquid which may cause burns if ignited. Do not use near open flames or electrical sparks.

8. Allow conductors to dry for at least 1 minute.

9. Fold the conductors of "folded" FCC (FCC with 0.30-inch strip length) using the CE-1402400 folding tool.

   - Both ends must be folded in the same direction (Figure 5-2).
   - Folding dimensions are shown in Figure 5-2, for reference.
   - Fold only one of the FCC's for a two-cable insert. (Fold the FCC with the longer, 0.30-inch, strip length. Do not fold the FCC with the shorter, 0.20-inch strip length.)
   - Refer to ES-61112 for FCC folding tool operation.

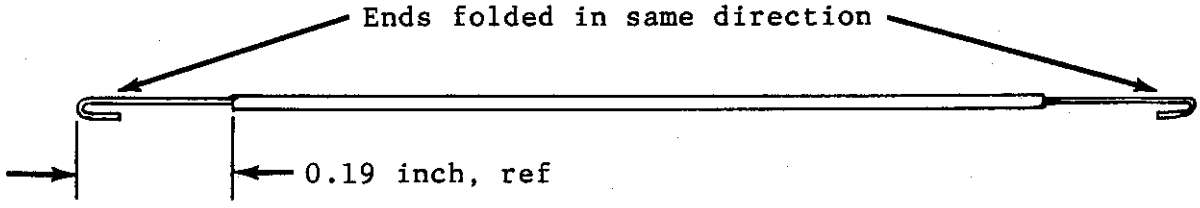


Figure 5-2. FCC Folding Dimensions and Directions

5.2 Inserting FCC Into MTC50 Insert.

1. Insert the FCC (which must have folded conductors) into the boot of the MTC50 insert at one end of the harness (Figure 5-4).

   - o The folded FCC conductors go on top of the solder terminals.
   - o Cable insertion tool CE-1401000 must be used to aid cable insertion (Figure 5-3).
   - o Insert the cable until it bottoms inside the boot of the insert.
   - o If this insert has a single layer of FCC, skip to step 4 after completion of this step.

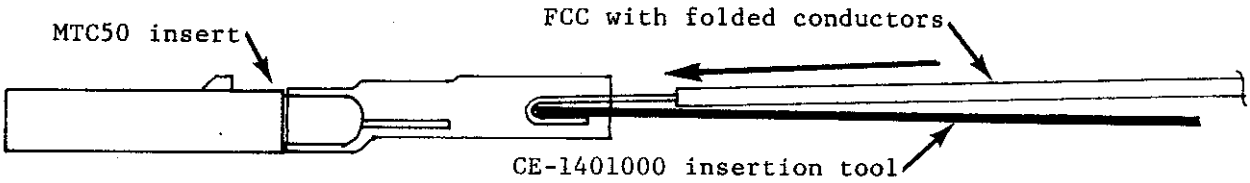


Figure 5-3. Use of Cable Insertion Tool

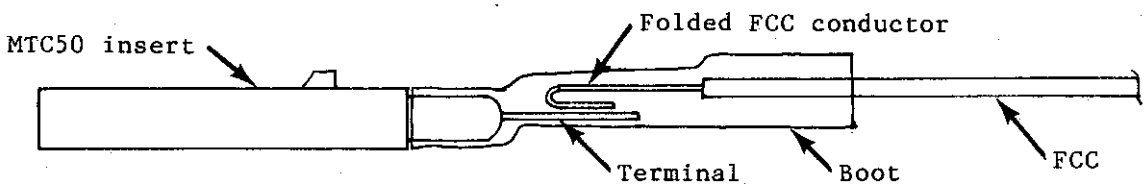


Figure 5-4. FCC Inserted Into Boot of MTC Insert

2. (Inserts with 1-1/2 or two layers of FCC only) Insert the remaining (nonfolded) FCC into the boot on top of the folded FCC (Figure 5-5).

   - Be careful not to snag the conductors on the meltable sealant within the boot.
   - Insert the FCC until it bottoms.

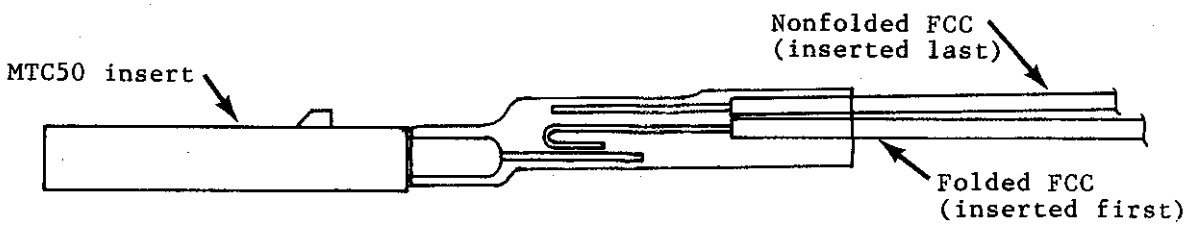


Figure 5-5. Both FCC's Inserted Into Boot

3. (Inserts with 1-1/2 or two layers of FCC only) Install a full (2-inch) strip of meltable sealant between the two layers and across the full width of the connector insert. In 1-1/2 layer configurations, install an additional short (1-inch) strip of sealant beside the half layer (Figure 5-6).

   - Cut 2-inch lengths of CTA-0055 sealant in half to make 1-inch strips.
   - Make sure that the sealant strips are positioned completely inside the boot.
   - The assembled insert and FCC can be held in place with tape until time for heating.

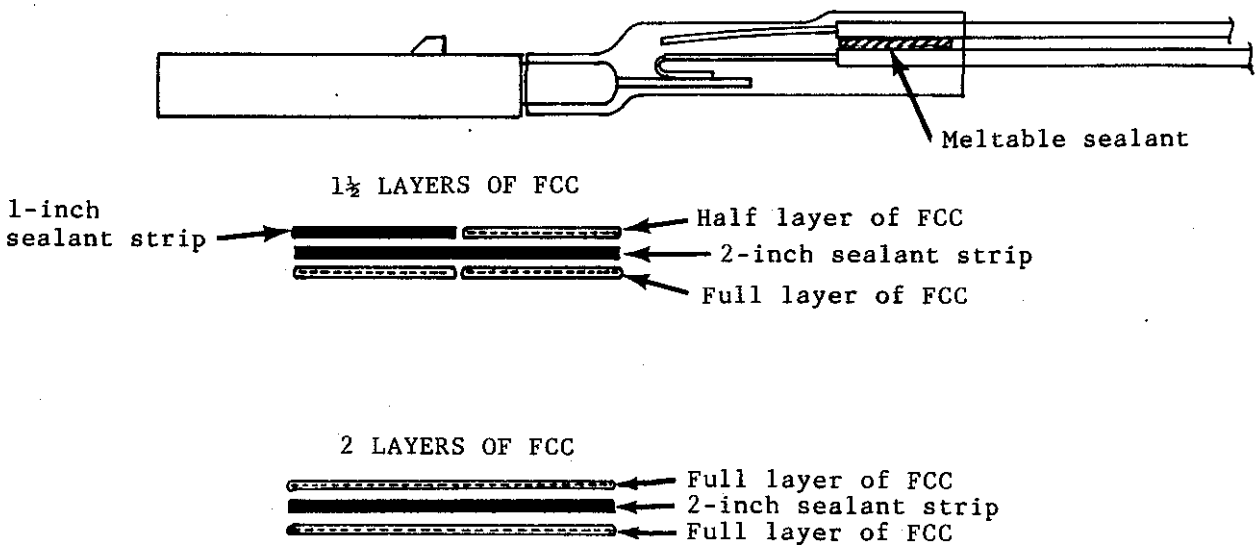


Figure 5-6. CTA-0055 Sealant Inserted Between FCC Layers

4. Repeat steps 1, 2, and 3 (as applicable) for the opposite end of the harness.

   - The MTC50 inserts must be oriented the same at both ends of the harness.

5.3 Heating.

The heating procedure is described in detail in Section 3.3 of ES-61402, Waffle Iron II Operating and Maintenance Instruction.

CAUTION
In keeping with good industrial hygienic practice, adequate ventilation must be maintained whenever industrial heaters are used.

1. Make sure that the Waffle Iron II set-up has been completed as described in Paragraph 5.1 of the Waffle Iron instructions and as follows:

   o Use the platens and control settings listed in Table 5-1 below.

Table 5-1. Waffle Iron II Platens and Control Settings

Cable Configuration	MTC Insert Type	Platen No.	Control Setting TEMP/TIME
Single layer	MTC50 Pin	CE-1513700	1 / 2
	MTC50 Socket	CE-1513600	1 / 2
1-1/2 or 2 layers	MTC50 Pin	CE-1514700	1 / 2
	MTC50 Socket	CE-1516700	1 / 2

2. Load the insert/cable assembly into the Waffle Iron II.

   o The insert positioned against the stop in the platen.

   o Retention ribs facing upward.

   o Cable extending to operator's right.

3. Line up cable with guide lines in Waffle Iron upper surface.

4. Close the cable clamp.

5. Inspect for proper loading and cable insertion.

6. Close and latch the upper heat sink.

7. Press the START button.

   - The green READY/ERROR light must be illuminated before the heating cycle can be started.

8. Allow the heating cycle to continue until the READY/ERROR light comes on again.

9. Open the upper heat sink and remove the terminated assembly.

10. Inspect the terminated assembly (Section 6).

6.0 INSPECTION OF TERMINATIONS

6.1 Inspection for Conductor Positioning.

FCC conductors are to be positioned on insert terminals as shown in Figure 6-1.

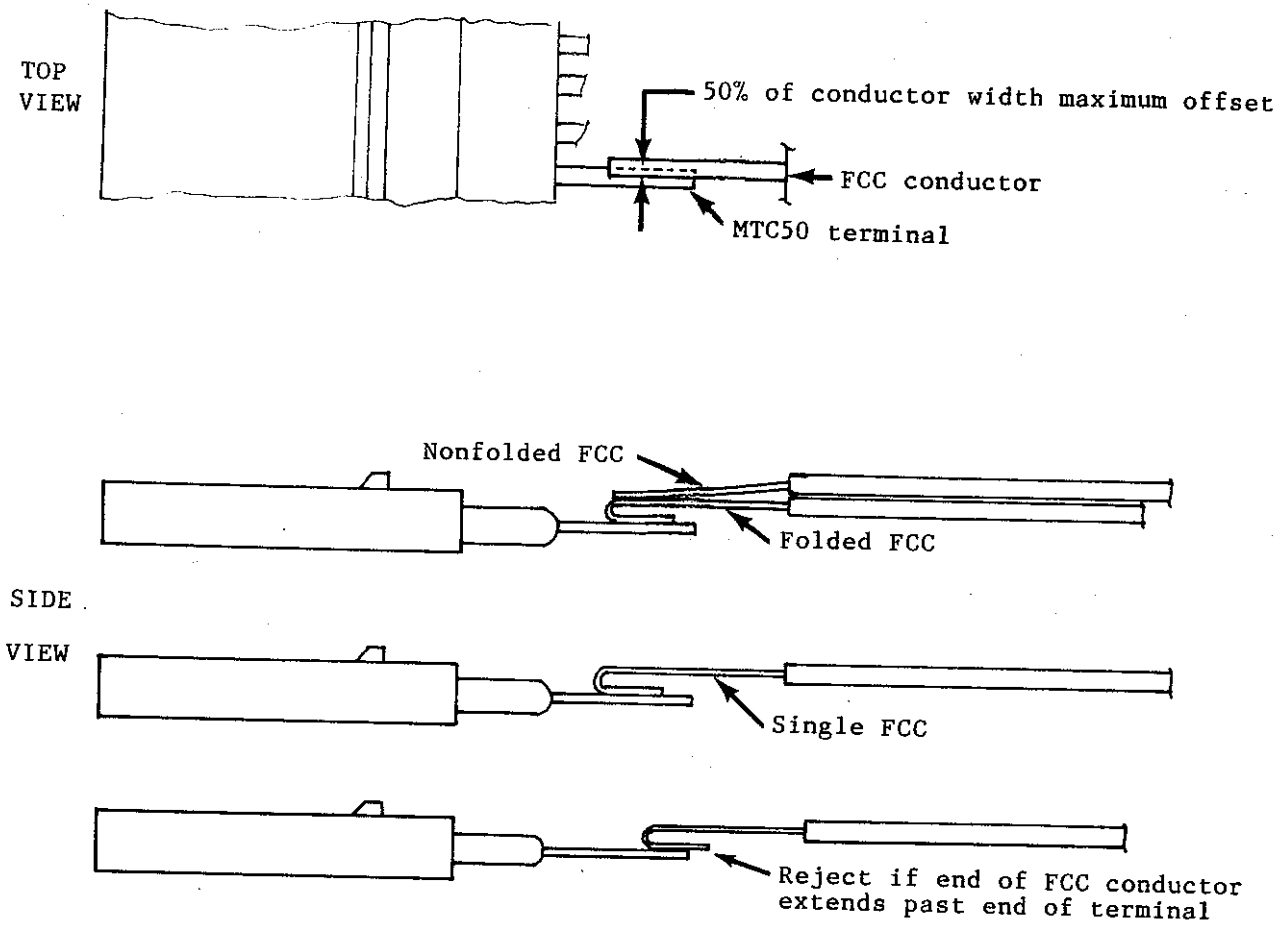
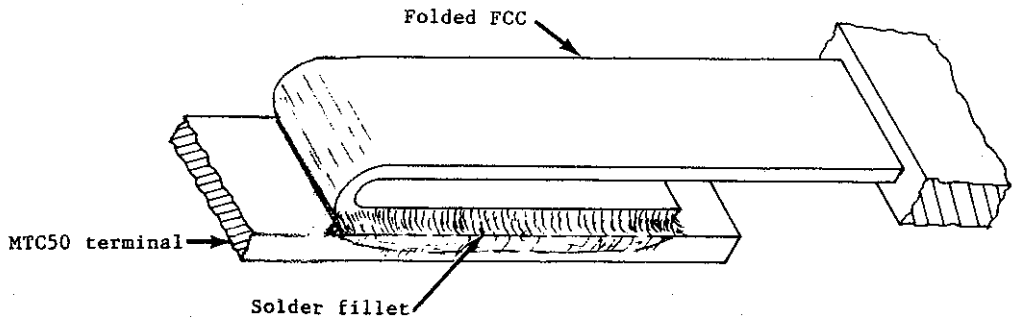


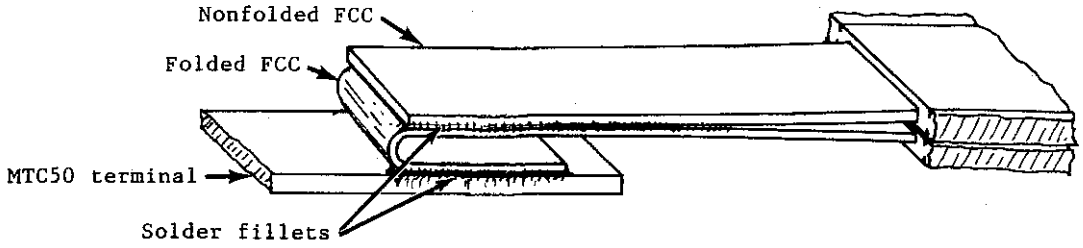
Figure 6-1. Inspection for Conductor Positioning

6.2 Inspection for Proper Soldering.

The solder coating on conductors and terminals must have melted and flowed so that solder fillets are formed between conductors and terminals. Figure 6-2 illustrates the areas to inspect for solder fillets. Use of a microscope with approximately 10X magnification is recommended to aid in visual inspection for proper soldering.



SINGLE LAYER OF FCC



TWO LAYERS OF FCC

Figure 6-2. Inspection for Solder Flow

6.3 Electrical Testing.

The following electrical tests are recommended for the completed termination.

1. Electrical continuity.

2. Insulation resistance. Requirement is 5000 megohms, minimum, at 500 V dc.

3. Dielectric withstanding voltage. Requirement is 2.0 mA maximum leakage at 300 V rms.

7.0 CABLE ASSEMBLY PROCEDURES

7.1 Busbar and Planar Shield Preparation.

A planar shield is used between the two layers of FCC to isolate the two FCC layers from each other (Figure 7-1). The planar shield is terminated by means of busbars at each end. Perform the following procedures for both ends of the shield.

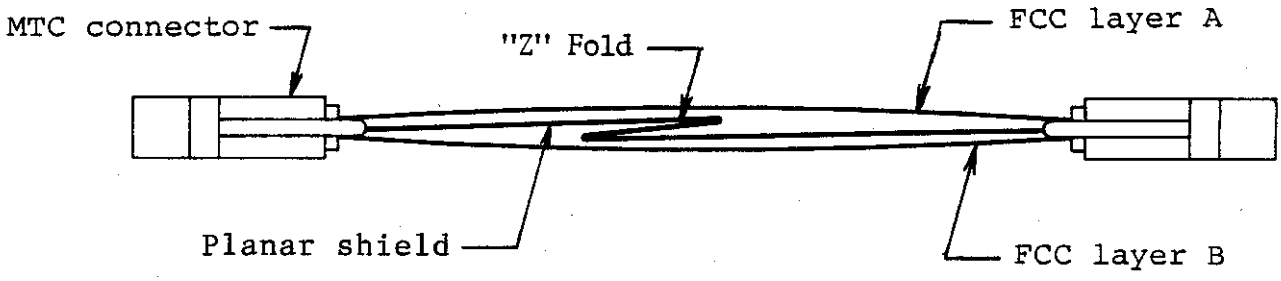


Figure 7-1. Location of Planar Shield in FCC Cable Asembly

1. Cut the planar shield to the required length (Figure 7-2).

   - Total shield length is the harness length on Raychem drawing 2034AS503 or 2034AS504, plus 6 inches.
   - Use Carpenter Model 95A flat cable cutter or a sharp paper cutter.

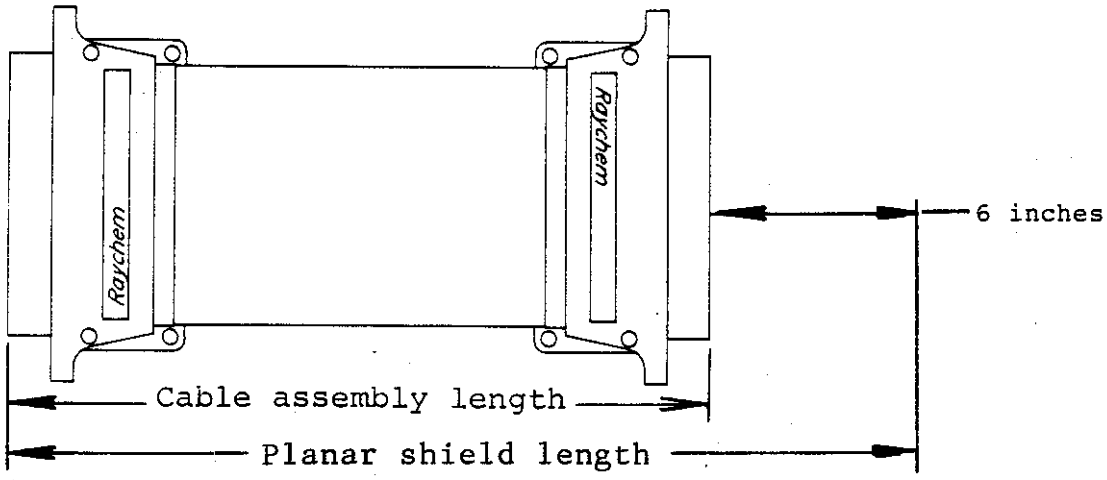


Figure 7-2. Length Determination of Planar Shield

2. Strip the shield insulation for a distance of 0.2 ± 0.1 inch (Figure 7-3).

   - Use the Carpenter Model 44B abrasive wheel stripper with abrasive wheel No. 2490.
   - Remove insulation from both surfaces of the shield.

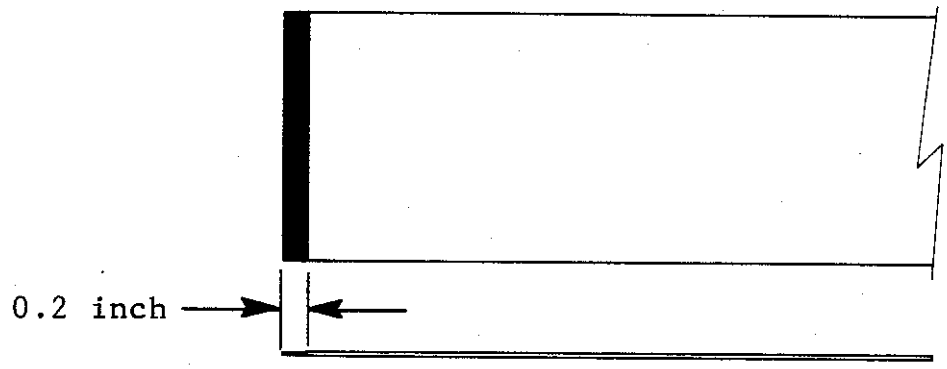


Figure 7-3. Stripping Planar Shield

3. Flux the stripped end of the shield for half to three quarters of its length.

   - Use type RA flux (Kester No. 1744 or equivalent) diluted 1:1 with flux thinner (Kester No. 104 for Kester flux).
   - Apply flux by dipping or by use of a cotton tipped applicator.

4. Pretin the stripped end of the shield to three quarters of its length using Sn63 solder.

   - Use a hand soldering iron.
   - Pretin both surfaces with a thin solder coating. Avoid buildup of solder thickness.

5. Clean off the flux residue using isopropyl alcohol or appropriate flux thinner.

WARNING

Isopropyl alcohol is a volatile, flammable liquid which may cause burns if ignited. Do not use near open flames or electrical sparks.

6. Apply a light coat of flux to the tinned end of the shield.
   - o Use type RMA flux (Alpha No. 611 or equivalent) diluted 1:1 with flux thinner (isopropyl alcohol for Alpha flux).
   - o Use a cotton tipped applicator and avoid heavy application.
   - o Allow flux to air dry for at least 1 minute.
7. Insert the end of the shield into the clips at the rear of the busbar as shown in Figure 7-4.
   - o The shield fits on top of the busbar and under the clips.
8. Solder the shield to the busbar using a hand soldering iron.
9. Clean off the flux residue using isopropyl alcohol or appropriate flux thinner.

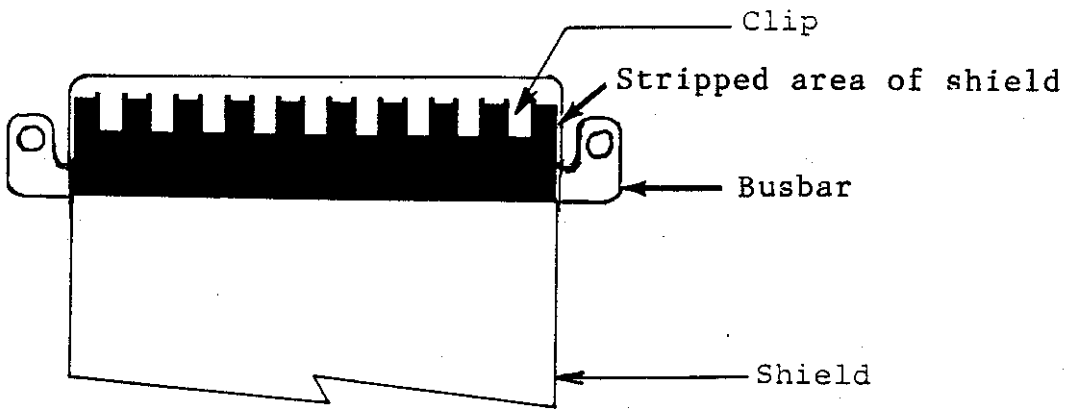


Figure 7-4. Inserting Prepared Planar Shield into Clips of Busbar

7.2 Inserting Terminated Inserts into Shells.

1. Check the cable assembly drawing and match up the correct insert pairs for insertion into the connector shell.

   - Both inserts must be the same mating type: Two pin inserts or two socket inserts, unless one insert is a dummy and has no cable terminated to it.

   - One A insert and one B insert always fit together in a shell, unless one insert is a dummy.

2. Position the two inserts evenly together with their keying ribs facing outward.

3. Orient the A insert toward the A side of the shell and the B insert toward the B side of the shell (Figure 7-5).

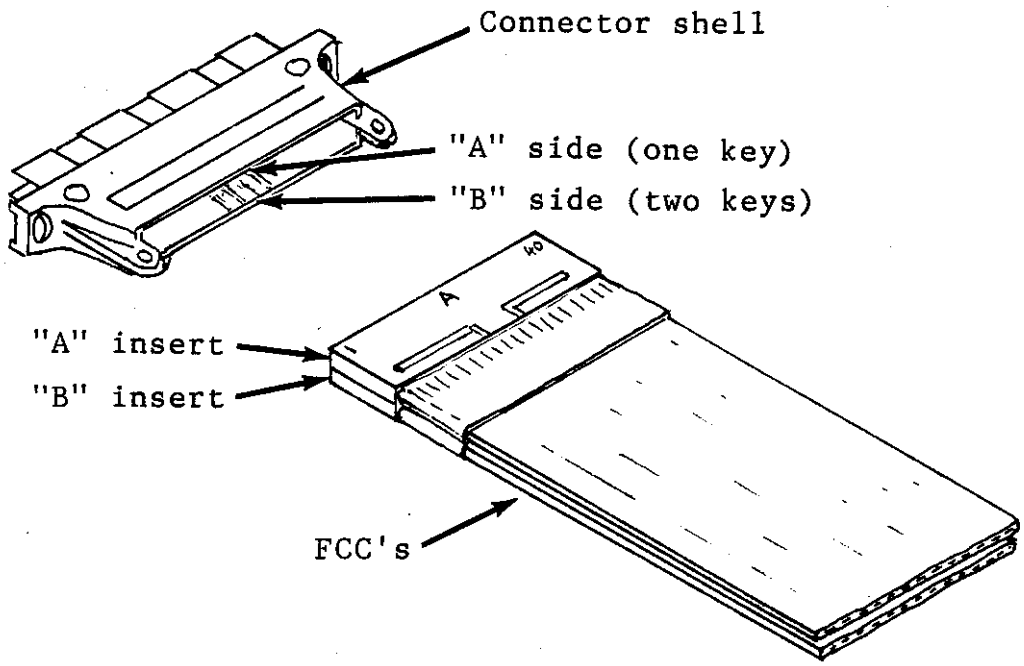


Figure 7-5. Terminated Insert Pair Ready for Insertion into Shell

4. Push the inserts in until the retention clips for both inserts click into place.

   - If one of the inserts is a dummy, use the CE-1201900 (or D-659-0001) insert removal tool to push the insert into place.

5. Pull on each FCC separately to make sure that both inserts are seated and locked into place.

7.3 Installing Planar Shield.

Insert the planar shield with the attached busbars between the two FCC layers, so that the mounting holes of the busbars are lined up with the cable clamp holes in the connector shells at both ends.

- Put a Z fold in the shield to produce the proper length (Figure 7-1).

7.4 Installing Wraparound Shield.

1. Cut the wraparound shield to the length required.
   - Shield length is the harness length on Raychem drawing 2034AS503 or 2034AS504, minus 2.2 inches.
   - Shield must be cut square and cleanly without bending the ends.
   - Use scissors or paper cutter to obtain square cut.
2. Trim the end of the shield as shown in Figure 7-6, using scissors.
   - For the notch near the middle, make lengthwise cuts about 1/16 inch each side of the crease, to create a notch of about 1/8 inch width.

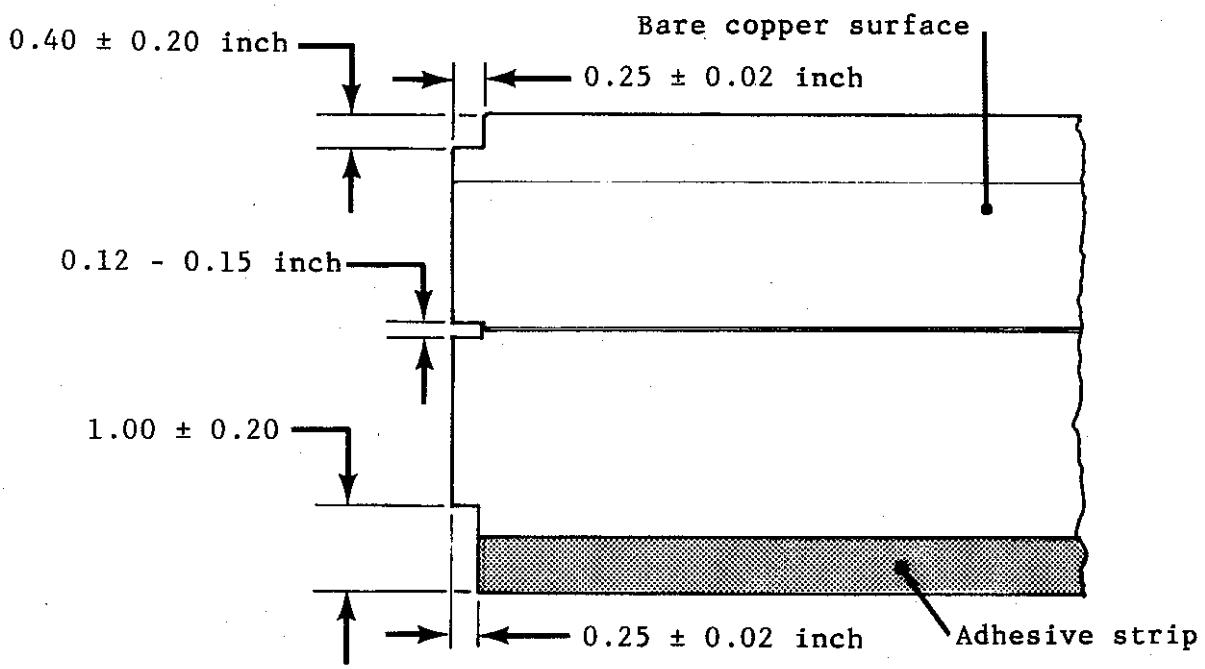


Figure 7-6. Trimming of Wraparound Shield

3. Pretin the bare copper side of each flap as shown in Figure 7-7.

   o Use type RA flux (Kester #1544 or equivalent) diluted 1:1 with flux tinner (Kester #104 thinner for Kester #1544 flux), Sn63 solder, and soldering iron.

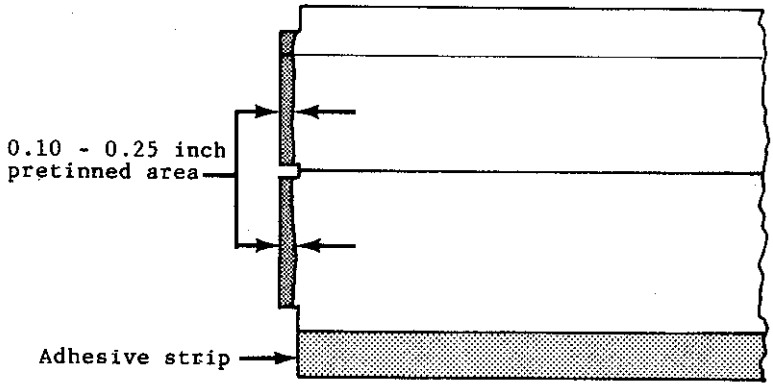


Figure 7-7. Pretinning Wraparound Shield

4. Clean off flux residue using isopropyl alcohol or other approved flux remover.

WARNING
Isopropyl alcohol is a volatile, flammable liquid which may cause burns if ignited. Do not use near open flames or electrical sparks.

5. Prepare the opposite end of the shield in the same way.

6. Fold the shield around the harness as shown in Figure 7-8.

   o The flaps should overlap the rear of the boots of the connector inserts.

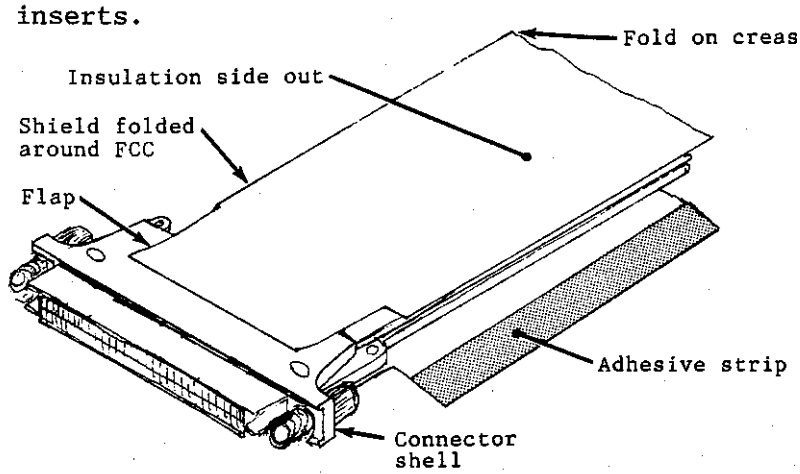


Figure 7-8. Wraparound Shield Folded Around Harness

7. Fold the narrow edge of the shield (the edge without an adhesive strip) around the edge of the cable for the full length of the harness (Figure 7-9).

   o Keep the cable assembly straight, and fold carefully to prevent buckling of the shield.

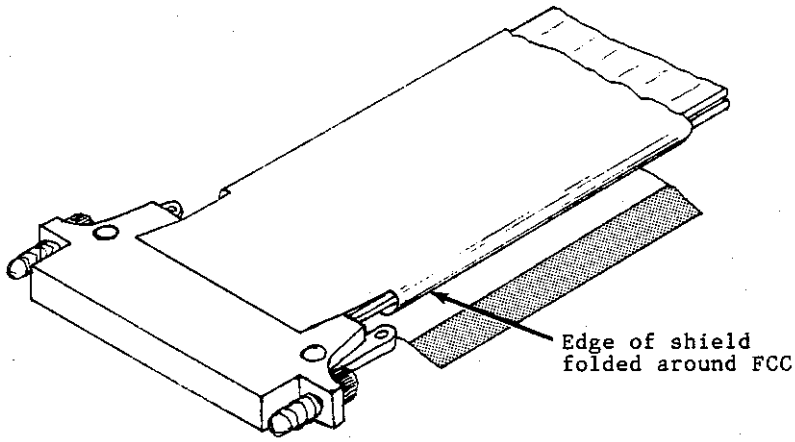


Figure 7-9. First Edge of Shield Folded Over

8. Remove the release paper from the adhesive strip and fold the adhesive edge of the shield over so that it sticks to the shield along the full length of the cable (Figure 7-10).

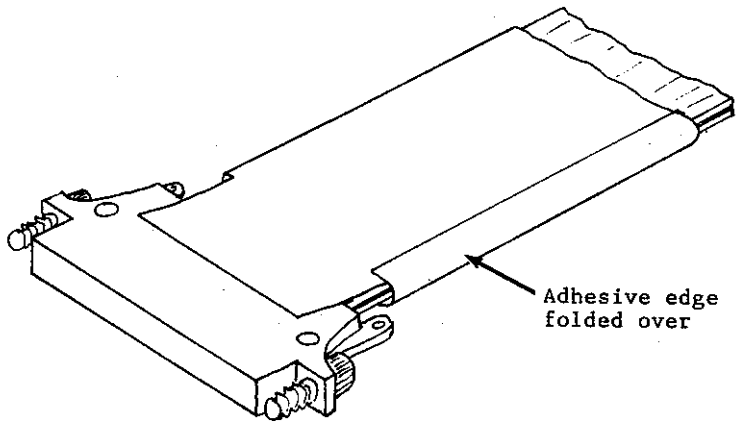


Figure 7-10. Adhesive Edge of Shield Folded Over

9. Fold both flaps back over the shielding at one end of the harness.

10. Position a busbar over the rear of the shell so that the holes in the busbar ears line up with the cable clamp holes in the shell (Figure 7-11).

    o Use of a fixture or alignment pins is recommended for holding the busbar in place at the rear of the shell.

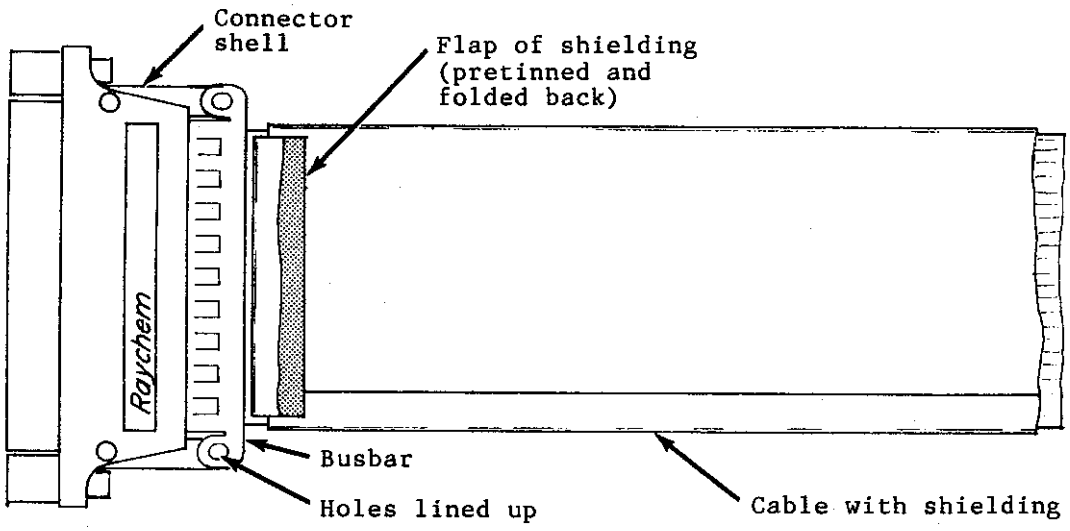


Figure 7-11. Busbar in Position for Soldering

11. Coat the pretinned area of the shield with type RMA flux (Alpha #611 or equivalent) diluted 1:1 with isopropyl alcohol or other approved flux thinner.

12. Fold the shield flap over the busbar.

13. Solder the shield flap to the busbar.

    o Reflow the solder on the shield flap using a soldering iron.

14. Install and solder the busbar for the other side of the assembly as directed in steps 10, 11, 12, and 13.

15. Repeat steps 9 through 14 for the other end of the harness.

16. Clean off flux residue using isopropyl alcohol or other approved flux remover.

17. Install the cable clamps on each connector.