Raychem

INTERCONNECTION SYSTEMS ENGINEERING STANDARD

TITLE	NUMBER
TERMINATION OF FLAT CONDUCTOR CABLE WITH PLANAR SHIELDING TO MTC50 CONNECTOR INSERTS USING WAFFLE IRON II HEATING TOOL	ES-61192

REV	DESCRIPTION	DATE	APPROVED
B	INITIAL RELEASE PER ECN# T-8938	10-26-87	E Stadler
C	REVISED PER ECN T-12249	5/31/89	GW Kelly

ES 61192

TERMINATION OF FLAT CONDUCTOR CABLE WITH PLANAR SHIELDING TO MTC50 CONNECTOR INSERTS USING WAFFLE IRON II HEATING TOOL

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1.0 PURPOSE AND SCOPE

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

MTC50 connector inserts:

MTC50-EA2-P12
MTC50-EB2-P12
MTC50-EA2-S12
MTC50-EB2-S12

Flat Conductor Cable:

TU40-050-28B: 28 gauge, 40-conductor, 0.050 inch nominal centers.

Consult Raychem before using other flat conductor cable.

Shielding Materials and Components:

Planar shielding without adhesive: CHA-0045

Planar shielding with adhesive backing: CHA-0033

Busbars: CTA-0004
CTA-0103
CTA-0111
CTA-0124
CTA-0126
CTA-0128
CTA-0132
CTA-0136
CTA-0140

Adhesive sealant strip: CTA-0055

2.0 REFERENCES

ES-61402: CE-1404200/CE-1404300 Waffle Iron II Heating Tool Instructions

ES-61113: CE-1400600 Flat Conductor Cable Stripper Instructions

3.0 TOOLS

CE-1404200 (115 VAC) or CE-1404300 (230 VAC) Waffle Iron II Heating Tool

Platen sets for Waffle Iron II heating tool (Table 1):

Table 1. Platen Selection for Waffle Iron II Heating Tool

Insert Type	Insert Part Number	Busbar Part No.	Number of Shielding Layers	Platen Set
Socket	MTC50-EA2-S12 MTC50-EB2-S12	CTA-0004	1	CE-1515900
			2	CE-1515800
Pin	MTC50-EA2-P12 MTC50-EB2-P12	CTA-0103 CTA-0111 CTA-0124 CTA-0126	1	CE-1516600
			2	CE-1517200
Socket	MTC50-EA2-S12 MTC50-EB2-S12	CTA-0128 CTA-0132 CTA-0136 CTA-0140	1	CE-1517300
			2	CE-1517400

CE-1400600 Flat Conductor Cable Stripper.

CE-1402400 Flat Conductor Cable Folding Tool.

CE-1401000 Flat Conductor Cable Insertion Tool.

Solder pot.

Soldering iron with small tip.

Flat cable cutter--Carpenter Model 95A or sharp paper cutter.

Carpenter Model 44B abrasive stripper or equivalent (for planar, nonadhesive shield).

4.0 MATERIALS

Solder: Sn63 or Sn60 per QQ-S-571.

Flux: Kester #1544 (Type RA per MIL-F-14256).

Flux Thinner: Kester #104.

Flux Remover: Isopropyl alcohol.

Adhesive remover: Acetone (for adhesive-backed shield).

5.0 FLAT CONDUCTOR CABLE (FCC) PREPARATION

5.1 Flat Conductor Cable Stripping and Tinning

1. Cut cable to desired length.
   - o Cable must be cut square and cleanly, without folding or bending ends.
   - o Recommended tools: Carpenter Model 95A flat cable cutter or sharp paper cutter.
2. Strip the cable insulation.
   - o Strip length: 0.280 to 0.300 inch.
   - o Stripping tool: CE-1400600 cable stripper.
3. Flux coat the exposed conductors.
   - o Dip the conductors for half to three quarters of their exposed length in a 1:1 mixture of type RA flux and the appropriate thinner (Kester #1544 flux and #104 thinner, or equivalents).
4. Allow fluxed conductors to dry at least 30 seconds.
5. Pretin the exposed conductors by dipping them in molten Sn63 or Sn60 solder.
   - o Solder temperature: 500° ± 20°F.
   - o Skim dross from solder in pot.
   - o Depth of conductor immersion: approximately three quarters of exposed length.
   - o Immerse conductors for 4 to 6 seconds.
   - o Withdraw slowly to prevent icicle formation.
6. Remove flux residue using isopropyl alcohol and tissue wipes.
   - o Hold FCC on flat surface and wipe toward ends of conductors only.

WARNING

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

7. Allow cleaned conductors to dry for at least 1 minute.

5.2 Flat Conductor Cable (FCC) Folding.

1. Position the CE-1402400 folding tool on bench with the clamp open and the clamp pad removed (Figure 5-1).

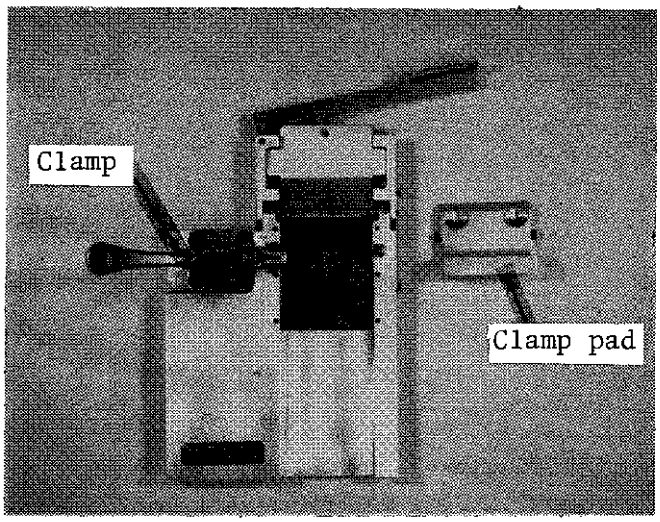


Figure 5-1. Folding Tool Ready for Use

2. Insert stripped and tinned FCC into the tool and align the insulation end with the positioning groove (scribed line) (Figure 5-2).

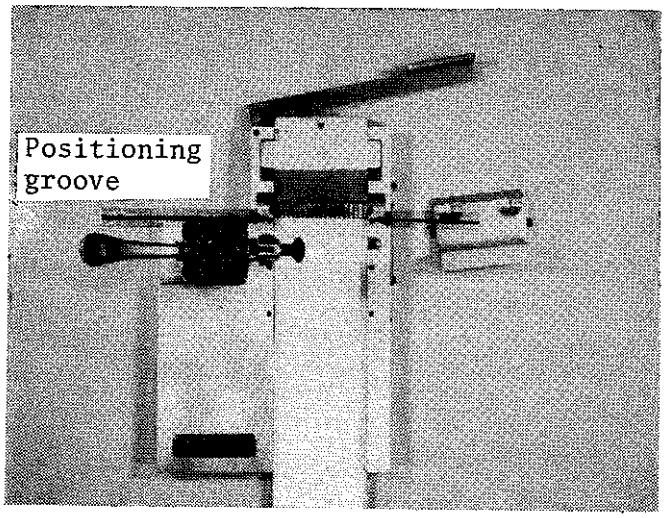


Figure 5-2. FCC Inserted into Folding Tool

3. Insert the clamp pad over the FCC (Figure 5-3).

   o Note positioning bosses at sides.

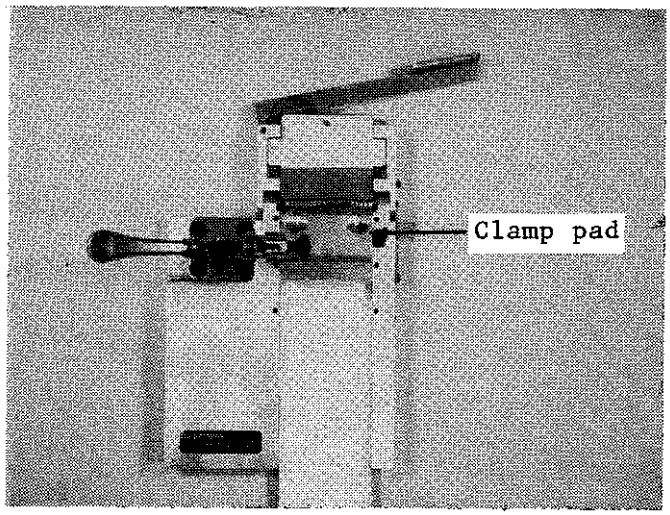


Figure 5-3. Clamp Pad Inserted Over FCC in Folding Tool

4. Close and latch the clamp.

   o Make sure that the cable remains correctly positioned.

5. Hold the handle away from the cable ("up"), and rotate the hinged end upward until it stops (Figure 5-4).

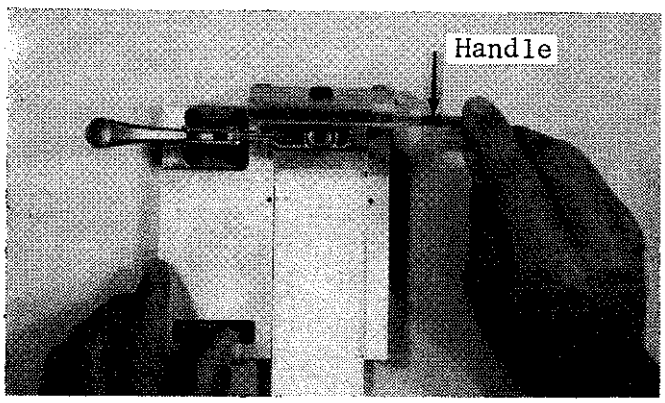


Figure 5-4. Hinged End of Tool Rotated Upward

6. Push the handle straight down.

   o This puts the initial bend in the conductors.

7. While holding the handle toward the hinged end ("down"), rotate the hinged end down to the bench surface.

8. Move the handle away from the cable (Figure 5-5).

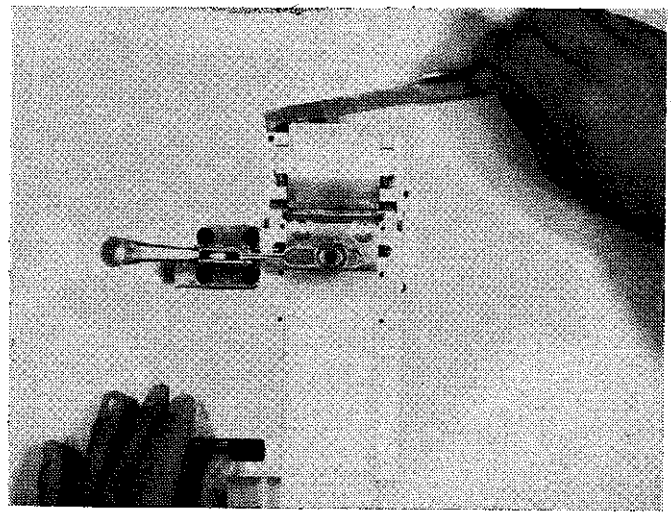


Figure 5-5. Moving Handle Away from Cable After Folding

9. Open the cable clamp and remove the clamp pad.

10. Carefully push the FCC toward the hinged end until the folded conductors are free; then remove the FCC from the tool.

11. Inspect the conductors for correct folding (Figure 5-6).

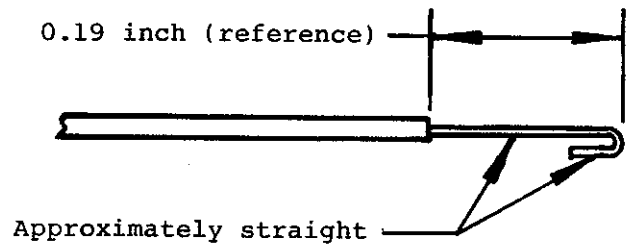


Figure 5-6. Correct Folding of FCC Conductors

6.0 SHIELD PREPARATION

Shielding may be installed on top of the FCC, on the bottom of the FCC, or both. The shield is prepared the same in all cases.

1. Cut shield to the desired length.

2. Strip insulation or adhesive at termination end of shield to dimension shown in Figure 6-1. Method of stripping depends on type of shield as follows:

   a. Adhesive Backed Shield (CHA-0033): Peel back the clear Mylar release liner (on light colored side of cable) far enough to expose the area to be stripped. Remove adhesive using swabs and acetone.

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

   b. Plain Mylar Coated Shield (CHA-0045): Strip shield using a Carpenter Model 44B abrasive stripper or equivalent.

3. Trim off corners as illustrated in Figure 6-1.

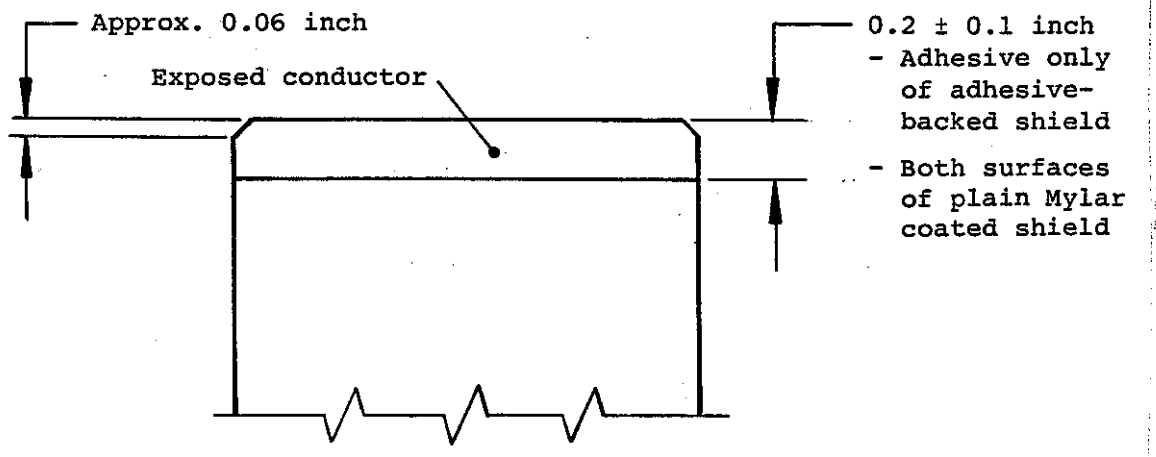


Figure 6-1. Shield Stripping and Trimming

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

   - Use Kester #1544 flux diluted 1:1 with Kester #104 flux thinner.
   - Apply flux by dipping or by use of a cotton tipped applicator.

5. Pretin the stripped end of the shield for half to three quarters of its length.

   - o Use a hand soldering iron.
   - o Pretin both surfaces of Mylar coated shield.
     Pretin the exposed copper surface of adhesive backed shield.

6. 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.

7. Apply a light coat of flux to the tinned end of the shield.

   - o Use a 1:1 mixture of type RA flux and the appropriate thinner (Kester #1544 flux and #104 thinner, or equivalents).
   - o Use a cotton tipped applicator and avoid heavy application.
   - o Allow flux to air dry for at least 1 minute.

7.0 ASSEMBLING CABLE, SHIELD, AND CTA-0004 BUSBAR

If any busbar other than a CTA-0004 is being installed, proceed to Section 8.0.

7.1 CTA-0004 Busbar Preparation.

CTA-0004 busbars do not normally require trimming. If the CTA-0004 does require trimming, trim the grounding fingers as specified on the cable assembly drawing.

7.2 Attaching CTA-0004 Busbar to Shield.

1. Solder the CTA-0004 busbar to the shield.
   - o Locate busbar on shield as shown in Figure 7-1.
   - o Reflow the solder with the shield and busbar in position. Use a soldering iron and the least practical amount of solder. Do not add solder when attaching busbar to shield.
2. 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.

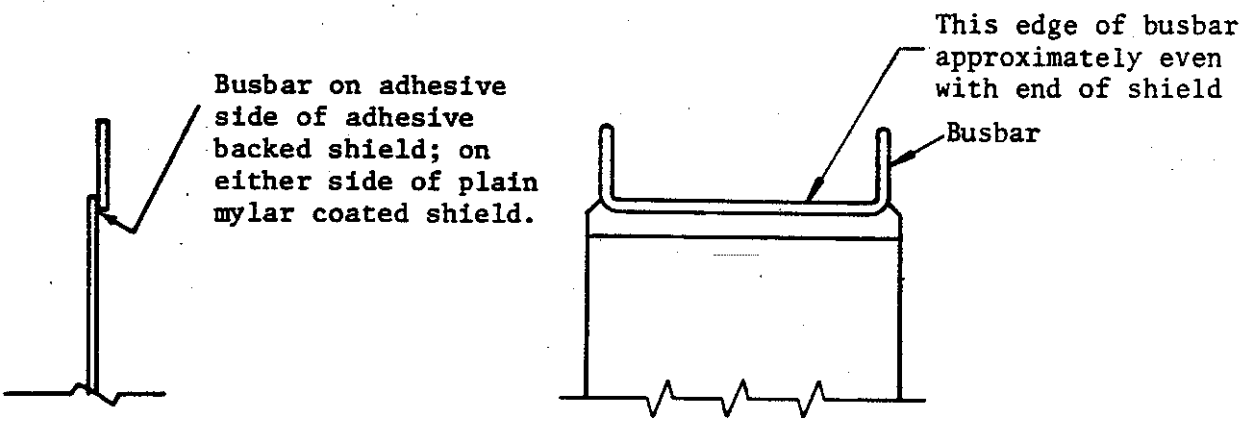
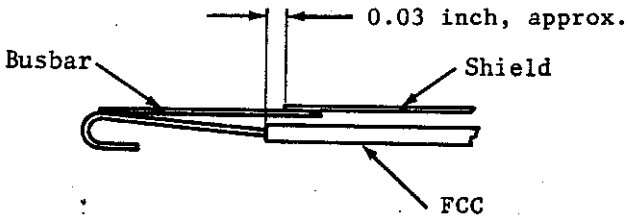


Figure 7-1. Soldering CTA-0004 Busbar to Shield

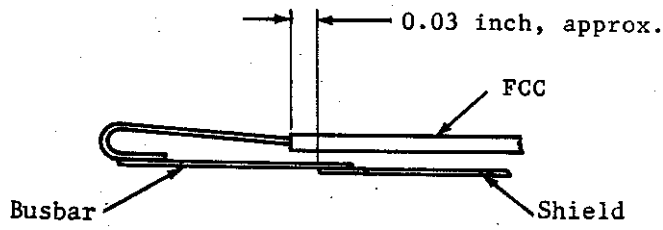
7.3 Attaching CTA-0004 Busbar to Flat Conductor Cable.

1. Solder the fingers of busbar CTA-0004 to conductors 1 and 40 of the flat conductor cable (FCC).

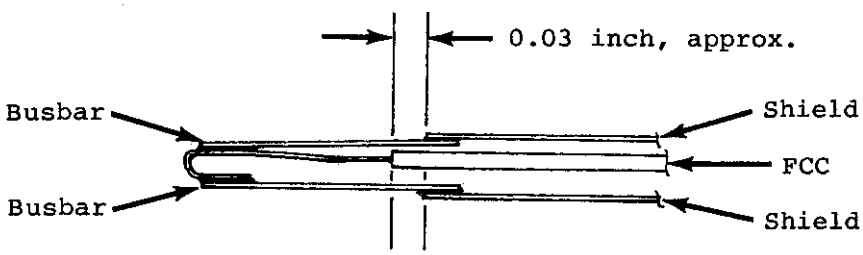
   - o The shield may be positioned on the top, the bottom, or both surfaces of FCC, depending on system requirements.
   - o Busbar will be between shield and FCC when adhesive backed shielding is used; busbar may face either toward or away from FCC when plain Mylar coated shield is used.
   - o Position shield so that the end (not including busbar) is behind the flat cable insulation by approximately 0.03 inch. See Figure 7-2.
   - o Position straight end of CE-1401000 insertion tool inside the fold to support conductors while soldering.
   - o Reflow the solder already present on the tinned conductors. Use a soldering iron and do not add solder.



SHIELD ON TOP OF FCC



SHIELD ON BOTTOM OF FCC



SHIELDS ON TOP AND BOTTOM OF FCC

Figure 7-2. Soldering Fingers of CTA-0004 Busbar to Conductors 1 and 40 of FCC

2. Remove cable insertion tool.

7.4 Inserting Cable/CTA-0004 Busbar/Shield Assembly Into Connector Insert.

1. Insert tinned, folded cable with shield(s) attached into boot of MTC50 insert.

   - Use the CE-1401000 cable insertion tool to aid in cable insertion (Figure 7-3). Each finger of the cable insertion tool should line up with one FCC conductor.

   - FCC conductors and busbar fingers must be positioned on top of the terminals as shown in Figure 7-4.

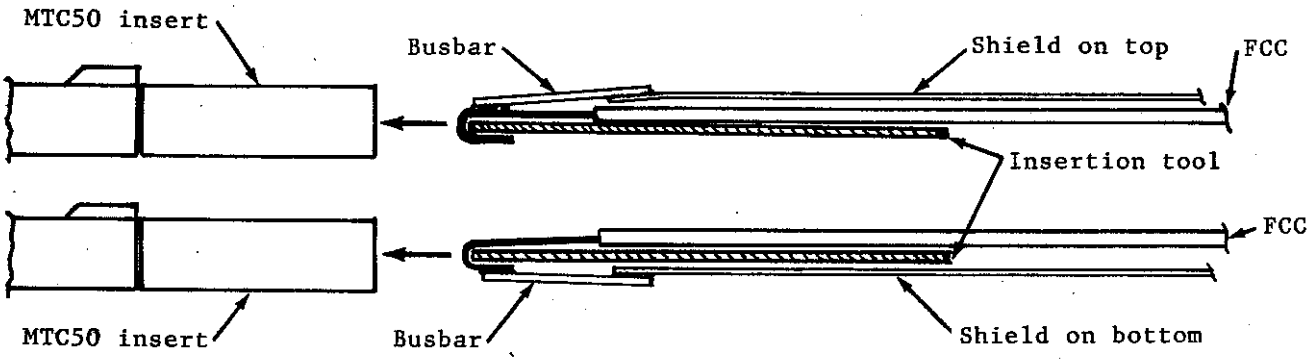


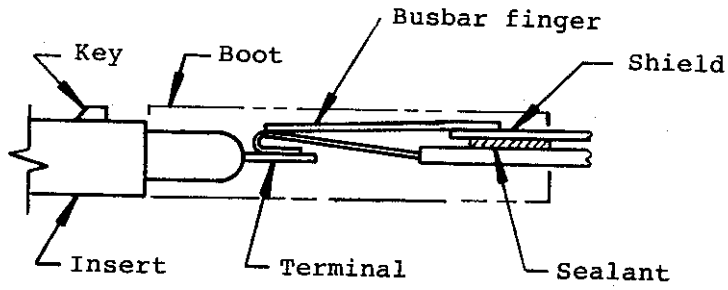
Figure 7-3. Use of CE-1401000 Cable Insertion Tool

2. Make sure that the cable is fully inserted, so that the cable conductors bottom against the stops within the boot.

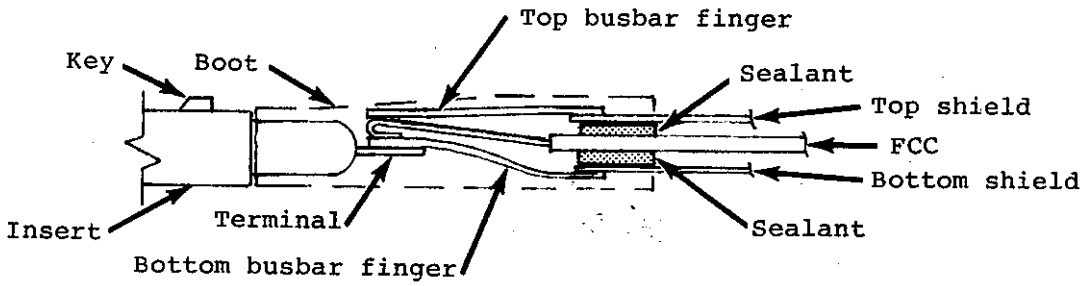
3. Remove the insertion tool.

4. Install a CTA-0055 sealant strip between the cable and each shield, within the boot area (Figure 7-4).

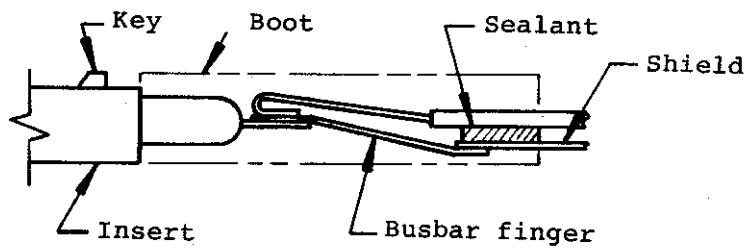
5. If shield is adhesive backed, peel back the release liner and stick the shield(s) to the FCC.



SHIELD ON TOP OF FCC



SHIELDS ON TOP OF AND BOTTOM OF FCC



SHIELD ON BOTTOM OF FCC

Figure 7-4. Cable, Shield and Sealant Installed in Boot of Insert

8.0 ASSEMBLING CABLE, SHIELD, AND BUSBAR EXCEPT CTA-0004

8.1 Busbar Preparation (Except CTA-0004).

1. If the busbar requires trimming, trim the grounding fingers as specified on the cable assembly drawing.

   - Figure 8-2 shows an example of a trimmed busbar. The fingers to be trimmed will vary with the application.
   - Make sure that there are no sharp edges poking out after trimming.
   - Type 1 busbars (Figure 8-1) typically require trimming.
   - Type 2 busbars (Figure 8-3) do not normally require trimming.

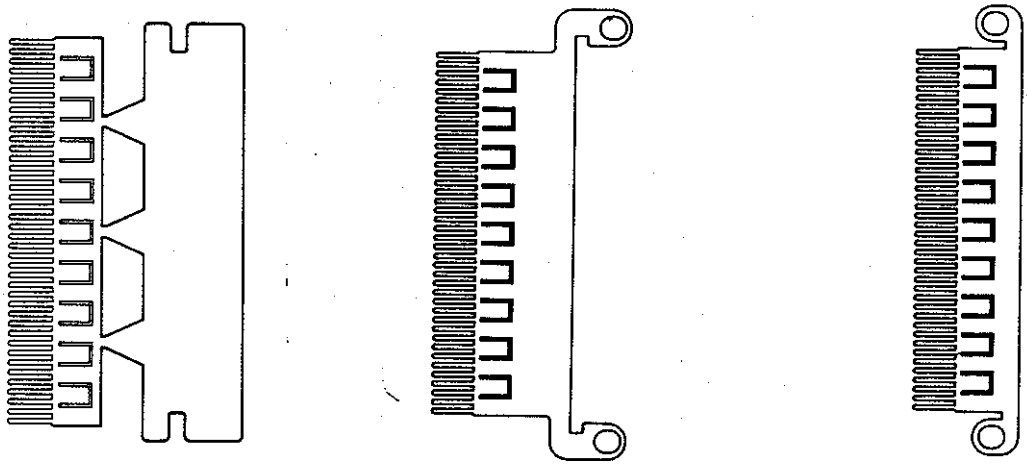


Figure 8-1. Type 1 Busbars: Trimming Typically Required

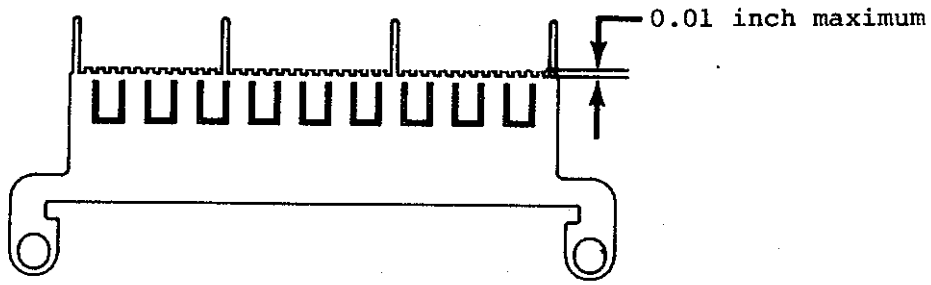
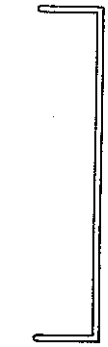
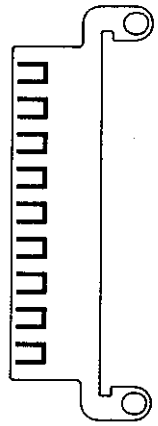


Figure 8-2. Example of Trimmed Type 1 Busbar (Typical)

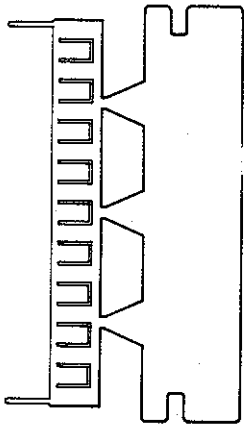


CTA-0004

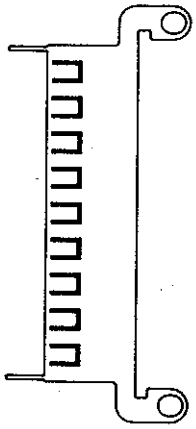
CTA-0103



CTA-0111



CTA-0132



CTA-0136

CTA-0140

Figure 8-3. Type 2 Busbars: Trimming Normally Not Required

2. Bend the clips approximately 1/16 inch (0.06 inch) in the direction that will face away from the FCC when assembled (Figure 8-4).

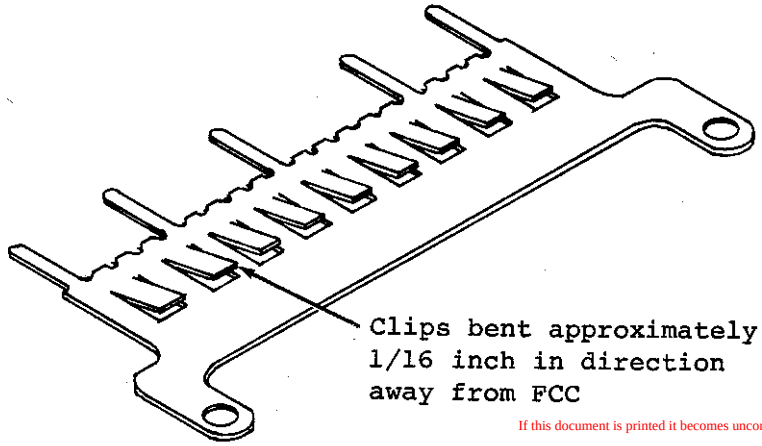


Figure 8-4. Bending Busbar Clips

8.2 Assembling Busbar (Except CTA-0004) to Shield.

1. If the shield is adhesive backed, peel the release liner back far enough to clear the termination area (2 inches minimum).

2. Install the busbar on the end of the shield (Figure 8-5).

   - The end of the shield must bottom between the clips and the main body of the busbar.

   - The clips must be positioned on the side of the shield that will face outward (away from the FCC). The clips must face away from the adhesive side of adhesive-backed shield.

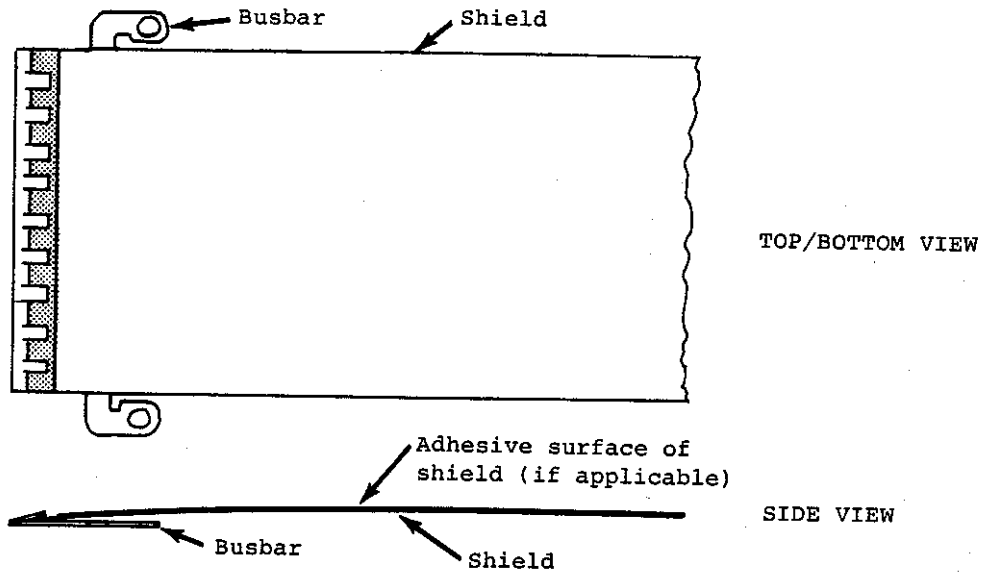


Figure 8-5. Installing Busbar onto Shield

8.3 Inserting Cable, Busbar (Except CTA-0004), and Shield Into MTC50 Insert.

Shield may be located on top or on the bottom of the FCC, or shields may be located both on top and bottom. See applicable cable assembly drawing for designated position(s).

1. If there is to be a shield on the bottom of the FCC, load the bottom busbar and shield together into the boot of the MTC50 insert as illustrated in Figure 8-6.

   - Position the busbar so that the fingers rest on top of the insert terminals and the clips face downward.
   - If there is to be no shield on the bottom of the FCC, skip this step and proceed to step 2.

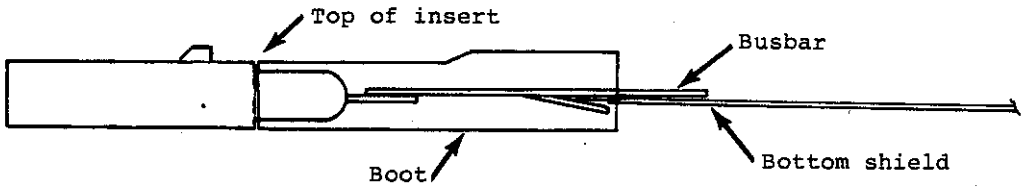


Figure 8-6. Busbar and Shield Underneath FCC (Where Applicable)

2. Insert the tinned, folded FCC into the boot of the MTC50 insert.

   - Use the CE-1401000 cable insertion tool to aid in cable insertion (Figure 8-7). Each finger of the cable insertion tool should line up with one FCC conductor.
   - Conductors must be positioned on top of the terminals as shown in Figure 8-8.
   - If the shield is adhesive backed, do not stick the shield to the FCC at this time.

3. Remove the insertion tool.

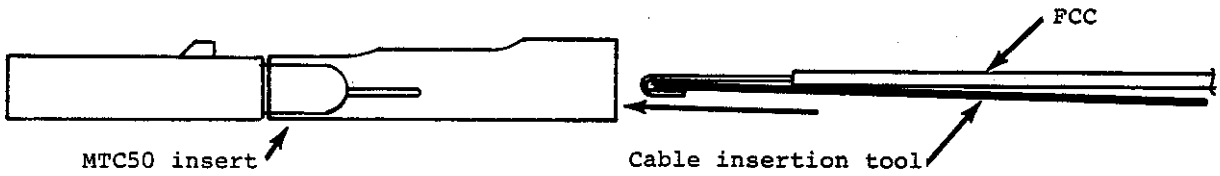


Figure 8-7. Use of CE-1401000 Cable Insertion Tool

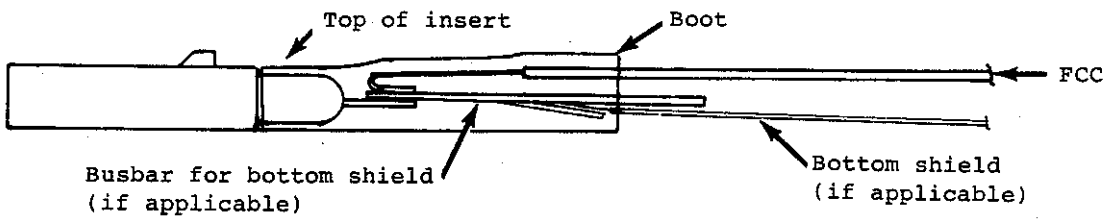


Figure 8-8. FCC Inserted into Boot of MTC50 Insert

4. Insert a CTA-0055 sealant strip between the FCC and the shield, and position it as shown in Figure 8-9.

   o If the shield is adhesive backed, stick the exposed adhesive area to the FCC at this time. Use the applicable bottom platen of the Waffle Iron as a fixture to position the busbar. (See Table 1 for platen selection.)

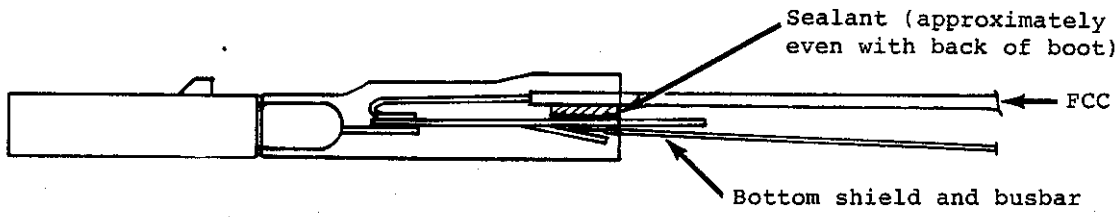


Figure 8-9. Position of Sealant Strip Between Bottom Shield and FCC

5. If there is to be a shield on top of the FCC, load the top busbar and shield together into the boot of the MTC50 insert as illustrated in Figure 8-10.

   - Position the busbar so that the fingers rest on top of the FCC conductors and the clips face upward (away from the FCC).
   - If there is to be no shield on top, skip this step and Step 6, and proceed to the next applicable section.

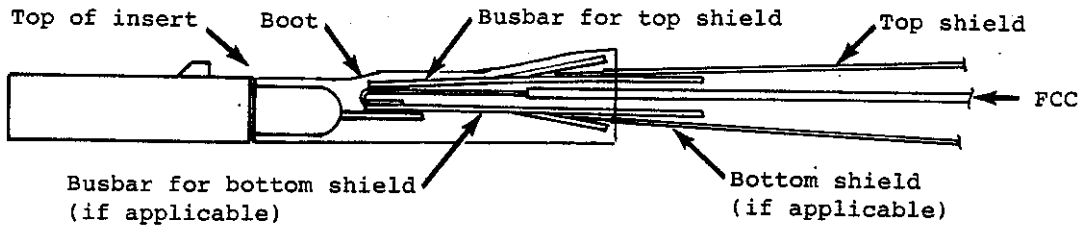


Figure 8-10. Busbar and Shield on Top of FCC (Where Applicable)

6. Insert a CTA-0055 sealant strip between the FCC and the top shield, and position it as shown in Figure 8-11.

   - If the shield is adhesive backed, stick the exposed adhesive area to the FCC at this time.

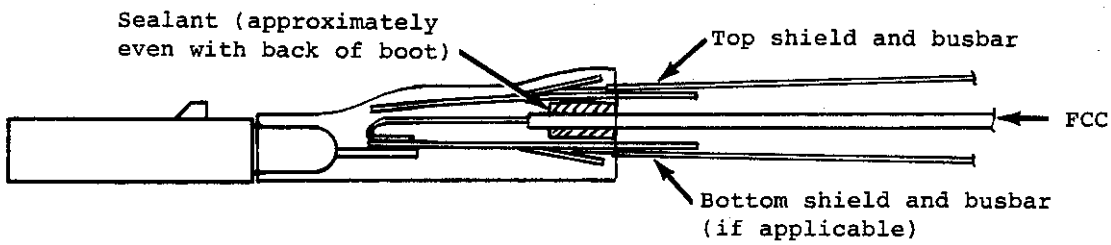


Figure 8-11. Position of Sealant Strip Between Top Shield and FCC

9.0 REMOVING CABLE FROM INSERT

Normally the cable is inserted and the termination process is continued. However, the cable can be removed from the boot before termination, if necessary.

1. Insert the CE-1401000 cable insertion tool underneath the cable and into the conductor fold.

2. Use the insertion tool to raise the tips of the conductors while carefully withdrawing cable and tool together.

10.0 HEATING

10.1 Waffle Iron II Set-Up

1. Select the platens for the flat conductor cable, connector insert, and shield combination to be terminated.

   o See Table 1 for platen selection.

2. Set up the Waffle Iron II as directed in Section 2 of the Waffle Iron II instructions (ES-61402).

3. Turn on the Waffle Iron II as directed in paragraph 3.1 of the Waffle Iron II instructions (ES-61402).

4. Set the Waffle Iron II TEMPERATURE and TIME controls as shown in Table 2.

TABLE 2. Waffle Iron II Control Settings

Platen No.	Control Settings (TEMP/TIME)
CE-1515800	2 / 2
CE-1515900	1 / 2
CE-1516600	1 / 2
CE-1517200	2 / 2
CE-1517300	1 / 2
CE-1517400	2 / 2

10.2 Heating Procedure.

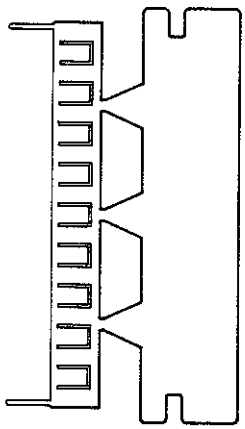
The heating procedure is described in detail in Section 3.3 of the Waffle Iron II Operating and Maintenance Instructions (ES-61402).

> 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 10.1 above.
2. Load the insert/cable assembly into the Waffle Iron II.
   - o The insert against the stop in the platen.
   - o Keyed side facing upward (flat side down).
   - o Cable extending to operator's right.
   - o Busbar(s) aligned in positioning guides of platen, where applicable.
3. Line up cable with guide lines on Waffle Iron.
4. Close cable clamp.
5. Inspect for proper loading and cable insertion.
6. Close and latch upper heat sink.
7. Press START button.
   - o 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 12 of this ES).

11.0 REMOVING FIXTURING TAB FROM BUSBAR (Where Applicable)

Some busbars have a fixturing tab used to locate the busbar in the platens during the heating procedure (Figure 11-1). After termination is complete, remove this tab by bending it back and forth until it breaks off, and discard it.



Typical busbar with fixturing tab

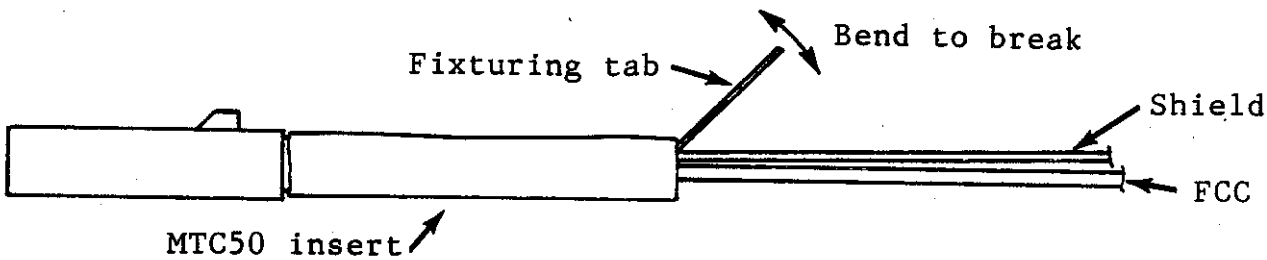


Figure 11-1. Removing Fixturing Tab from Busbars

12.0 INSPECTION

12.1 Workmanship and Damage Inspection.

Visually inspect the termination for damage, such as holes or tears in the boot, or overheating. The termination is overheated if the boot is darkened such that the conductors cannot be visually inspected.

12.2 Conductor Positioning Inspection.

Cable conductors must be positioned on terminals of inserts as illustrated in Figure 12-1.

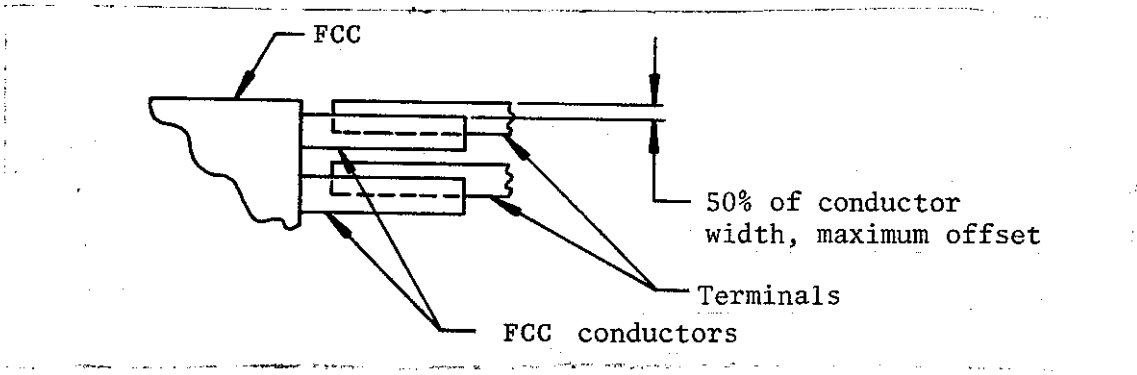


Figure 12-1. FCC Conductor Position on Terminals of MTC50 Insert

12.3 Soldering Inspection.

Solder coating on conductors and terminals must have melted and flowed so that fillets are formed between conductors and terminals. Figure 12-2 illustrates the areas to inspect for solder fillets. If fillets are visible on some of the conductors, it indicates that the components have achieved a high enough temperature to melt the solder on all of the conductors.

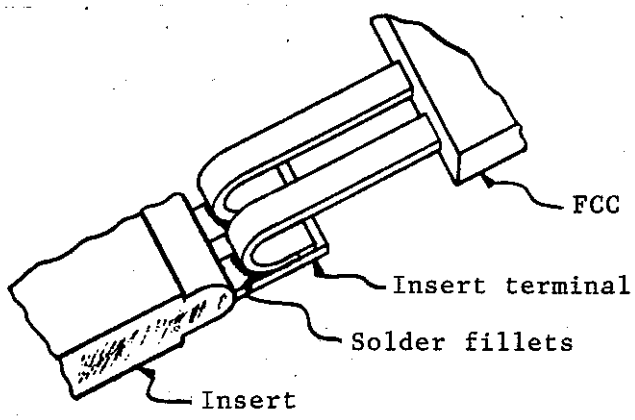


Figure 12-2. Inspection for Solder Fillets

12.4 Electrical Test Criteria.

The following electrical tests are recommended for the completed termination.

1. Electrical continuity.

2. Insulation Resistance. Insulation resistance shall be 5000 megohms, minimum, at 500 VDC.

3. Dielectric Withstanding Voltage. Dielectric withstanding voltage shall be 2 mA maximum leakage, at 300 VAC.