Isolated Downconductor Upper Termination Kit

Objective:

The objective of this document is to provide the procedure to terminate the upper termination of both the aluminum core (ISODC) series cable and the copper core (ISODCC) series cable, including the upper termination adapter and the primary equipotential bond. The procedure for installing the Isolated Downconductor system including fitting the lower termination adapter is found in the Isolated Downconductor System Model ISODC/ISODCC & Accessories instruction manual.

List of Suggested Tools:

The list of tools suggested to terminate the upper end of the cable are listed below and shown in Figure 1. Shown in Figure 1 is a 4 mm hex key wrench that is supplied in the Upper Termination Kit.

Figure 1. Suggested tools to terminate the upper end of the cable.

- Sharp knife
- Tape measure
- Cable Stripper INT-BZ IMS II (or equivalent)
- Standard pliers
- Electric heat gun, 2000 W with variable heat setting

Upper Termination Kit:

The list of parts included in the upper termination kit includes:

- 1, Stainless steel upper termination adapter with three, 8 mm setscrews
- 1, Stainless steel lower termination adapter with two, 8 mm setscrews (used in lower termination)
- 3, rolls of semi-conductive tape (550 mm lengths of “Scotch® 13 Electrical Semi-conducting Tape”) or similar
- 5, rolls of grey silicone rubber tape (300 mm lengths of “Scotch 70 Silicone Rubber Electrical Tape”) or similar
- 1, Stress-Relief heat shrink tubing (100 mm length) (black)
- 2, Anti-Tracking heat shrink tubing (each 300 mm in length) (red)
- 1, Loctite® threadlocker (0.5 mL tube)
- 1, 4mm hex key wrench
- 1, bonding braid terminated with setscrew connector
- 1, bonding wire, 4.5 m x 6 mm^2
- 1, Instruction sheet, IP8016_(x) (latest revision)
- 1, Instruction Manual, Isolated Downconductor System Model ISODC/ISODCC & Accessories (E6351)

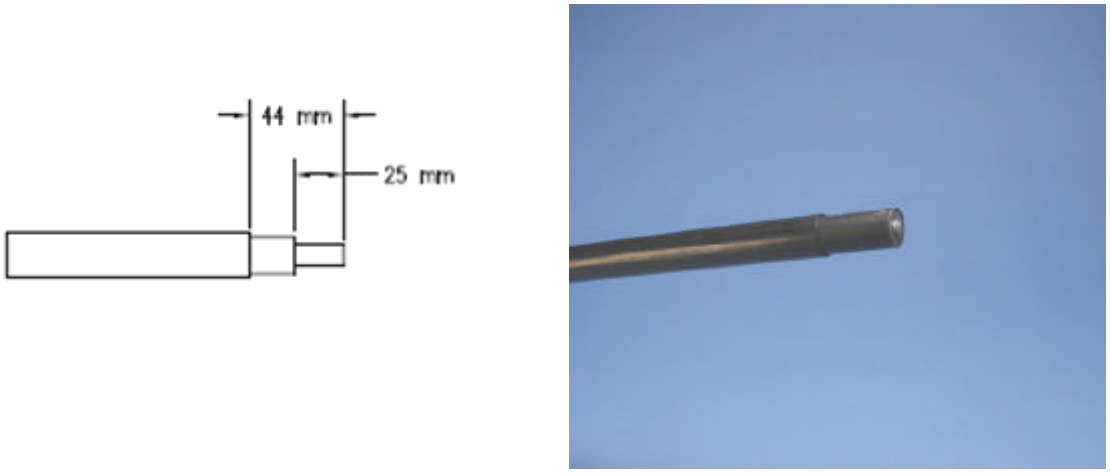
Due to a policy of continuing product improvement, items in the kit may differ slightly from that illustrated.

Procedure:
The integrity of the lightning protection system may be affected if these instructions are not followed correctly or if any of the conductor layers are incorrectly cut.

Installation of Upper Termination Adapter:

1) In accordance with the manufacturer's instructions, use Cable Stripper INT-BZ IMS II #17230 to remove the 25 mm of insulation as shown in Figure 2a. To remove the additional 19 mm of outer sheath from the cable, use a sharp knife being careful not to touch the insulation layer below the outer sheath. Use the following method described in Steps a-d if the Cable Stripper tool is not available.

   a) At a distance of 44 mm from the end of the cable, carefully cut a shallow notch into the cable sheath (black outer layer or "jacket") no deeper than 1 mm around the entire circumference of the cable.
   b) Using a knife carefully cut the outer cable sheath (no deeper than 1 mm) along the longitudinal cable axis for the 44 mm length. Remove and discard this severed outer layer. Figure 2b shows the appearance of the cable after completion of Steps (a) and (b).



(a) (b)

Figure 2. a) Dimensions on the end of the cable. b) The end of conductor after removing 44 mm of the outer sheath as described in Steps a) and b).

   c) Using the tubing cutter at a distance of 25 mm from the end of the cable, cut the triple extruded plastic insulation layer (seen as the black-white-black material) to a maximum depth of 6 mm.
   d) Carefully cut the plastic insulation with a sharp knife along the 25 mm length to a depth of 7 mm taking care not to score the cable strands. Using pliers, carefully remove the plastic insulation layer without disturbing the conductor inside. Figure 3 shows the end of the cable after completion of Step (d).

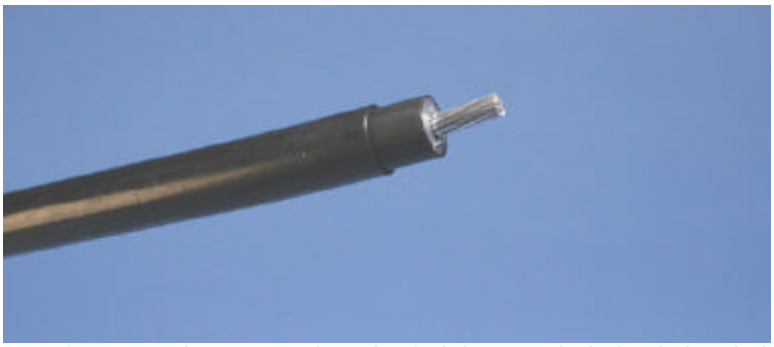


Figure 3. End of conductor after removing 25 mm length of triple extruded plastic insulation as described in Steps c) and d).

2) Ensure that all the strands and layers of the conductor are smooth and cylindrical, as they will not fit into the upper termination adapter if distorted or frayed. Compact and file off sharp edges if necessary. In addition, remove any surface oxidation from the conductor and apply an electrically conductive oxide inhibitor (e.g., Penetrox® **A-13** Electrical Joint Compound) to the conductor before inserting the conductor into the upper termination adapter. If an alternative electrically conductive oxide inhibitor is used, ensure that it is compatible with Cross-linked Polyethylene (XLPE) in the cable insulation and with Aluminum or Copper to Stainless Steel connections. For this reason, Penetrox **A** Electrical Joint Compound is not recommended.

3) Insert the conductor into the stainless steel inline splice adapter ensuring that all strands fit into the 9 mm hole inside the upper termination adapter and that it is pushed on as far as possible. There should be no gap between the upper termination adapter and the 7 mm-thick edge of the cable insulation.

4) Apply Loctite to the first two of the 8 mm set screws (nearest the cable) and tighten the 2 setscrews against the aluminum strands. Each setscrew should be tightened to 8 N-m. After completion of Step 4 the end of the cable will look like Figure 4.

Figure 4. End of conductor after insertion of cable into upper termination adapter as described in Steps 3 and 4.

5) Clean and degrease the outside of the upper termination adapter and the cable to ensure there is no residue around the perimeter of the adapter that will affect the bonding of semiconductive tape.

6) Using a 550 mm length of semi-conductive tape, apply the tape to the upper termination adapter as shown in Figure 5 by gently stretching and winding. Begin at least 20 mm from the bottom end of the upper termination adapter and overlap each wrap by one-half the width of the tape. Continue wrapping in the same manner over the gap between the upper termination adapter and the cable and eventually onto the cable sheath itself. An extra winding or two over the gap is desirable. The total coverage length of tape should be at least 75 mm.

Figure 5. Application of semi-conductive tape to the upper termination adapter and the cable.

7) Slide the black stress-relief heat shrink tubing (100 mm length) over the upper termination adapter and cable so that there is 20 mm of overlap over the upper termination adapter and the remaining 80 mm over the cable. Using an electric heat gun (2000 W rating, on medium setting), begin heating the tubing from the middle as shown in Figure 7. Use circumferential motion with the heat gun until the tubing contracts evenly around the cable and then move towards each end of the tubing by using the same motion until the whole tube has shrunk tightly around the cable and upper termination adapter. Allow it to cool for at least 10 minutes.

Figure 6. Use of heat gun to apply the stress relief heat shrink tubing around the upper termination adapter as described in Step 7.

8) Slide the red anti-tracking heat shrink tubing (300 mm length) over the upper termination adapter and cable so that there is 40 mm of overlap over the upper termination adapter and the remaining 260 mm over the cable. Using the same procedure as Step 7, shrink the tubing tightly around the upper termination adapter and the cable as shown in Figures 7 and 8. Allow it to cool for at least 10 minutes.

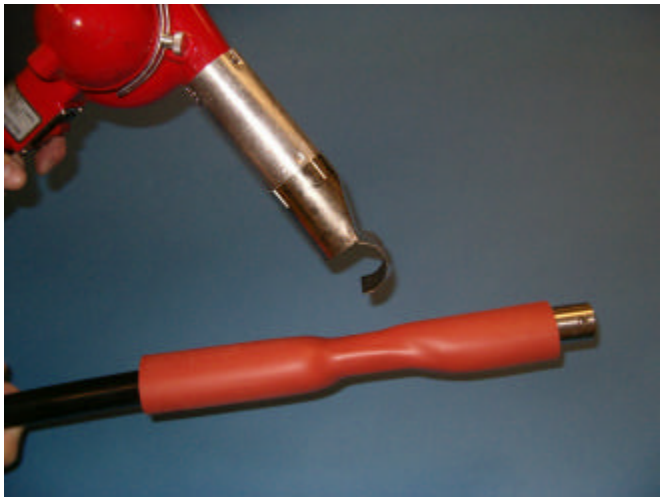


Figure 7. Use of heat gun to apply the red anti-tracking heat shrink tubing around the upper termination adapter as described in Step 8.

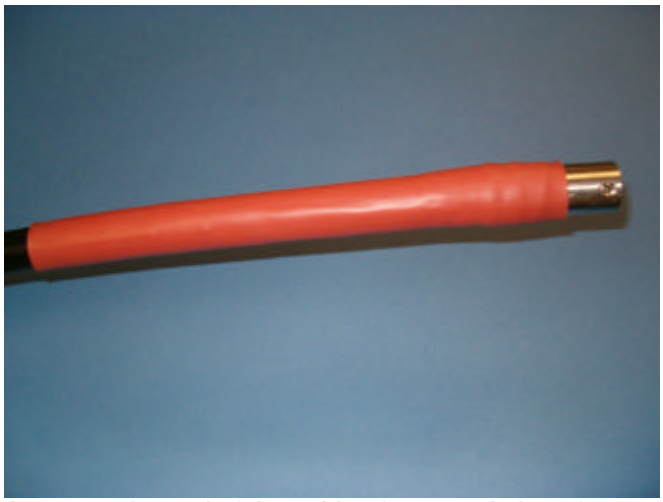


Figure 8. The end of the cable after completion of Step 8.

9) After the red anti-tracking heat shrink tubing has cooled, use a 300 mm strip of the grey silicone mastic sealant and wind it around the *top* end of the tubing and upper termination adapter in equal proportions, as shown in Figure 9. Ensure that the set screw is not covered in this procedure. Repeat the sealing procedure for the *lower* end of the red anti-tracking heat shrink tubing using another roll of the same tape.

Figure 9. Example of grey silicone rubber tape application as the final step in the process.

Installation of Primary Equipotential Bond:

1) Remove the clear plastic cover from the setscrew connector on the end of the bonding braid by removing 2 screws and sliding them apart. Discard the clear plastic cover and re-attach the coupling to the bonding braid.

2) At a distance of 2.25 m from the end upper termination adapter attach the bonding braid to the outside of the cable using 550 mm of semiconductive tape as shown in Figure 10 to smooth the connection profile. The total coverage length of tape along the cable should be approximately 50 mm. Semi-conductive or electrical tape should also be used to secure the tail of the braid to the cable while the anti-tracking tubing is applied.

Figure 10. Attachment of the bonding braid 2.25 m from the end of the cable.

3) Slide the red anti-tracking heat shrink tubing (300 mm length) over the bonding braid so that: (i) the "solder block" (a short section of the braided cable which is saturated with solder, if visible) and (ii) at least 25 mm of the green/yellow insulated portion of the braid, is underneath the tubing. Hence, the setscrew connector (used to attach to the equipotential bonding cable) and some length of insulated braid will be protruding. The positioning of the tubing according to this procedure is shown in Figure 11. Using the same procedure as Step 8, shrink the tubing tightly around the cable as shown in Figure 12.

Figure 11. Position the red anti-tracking heat shrink tubing over the bonding braid and shrink the tubing tightly around the cable using the heat gun.

Figure 12. The final state of the anti-tracking heat shrink tubing around the cable and bonding braid.

4) After the red anti-tracking heat shrink tubing has cooled, use a 300 mm strip of the grey silicone rubber tape and wind it around the one end of the tubing and cable in equal proportions. Repeat the procedure for the other end of the red anti-tracking heat shrink tubing. Extra care needs to be taken around the protruding, insulated braided cable, to ensure that a weatherproof seal is achieved.
5) Wrap the upper termination adapter and bonding braid connection in bubble wrap to prepare it for transportation.
6) Re-package remaining unused items with the cable for site installation of the lower termination adapter.

