

January 11, 2010

## VMP Tether Termination Splice (Revision 1)

Brett Prairie

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**Product reference:** all cable tethered VMP instruments

### ***Introduction***

This document describes how to do an in-field repair and re-termination of the connection between the tether cable and the underwater connector to the VMP instrument. This document applies to all tethered VMP instruments (VMP-200, VMP-500, VMP-750 and VMP-2000).

### ***Procedure***

This procedure assumes the worst case scenario where the tether has been damaged and must be cut to remove the damaged length. If you only need to replace the connector or some other part of the termination, you may skip the steps related to cutting the cable and preparing it for re-termination.

1. Spool out the cable until all the damaged sections are exposed. Cut the cable to remove the damaged sections.
2. Strip 4 to 5 inches of the cable jacket and the Vectran strength braid to expose the 4 conductors. See Figure 1. The conductors are wrapped with a clear tape. Remove this. Unravel about 1 to 2 inches of the conductors. Trim away the nylon filaments which are used as the cable fillers.

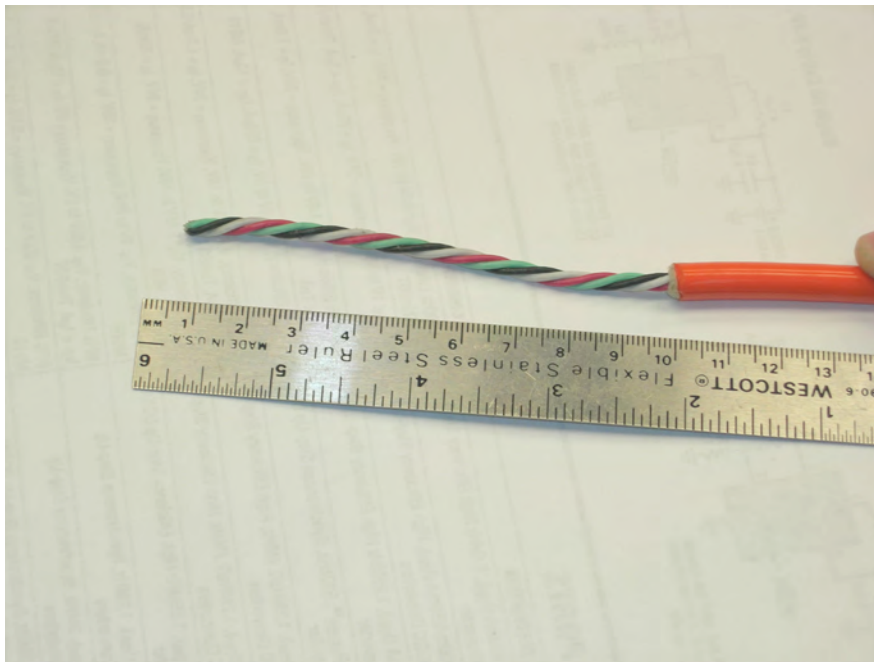


Figure 1: Cable jacket removed.

3. Using a very sharp knife, like a scalpel or an X-Acto, put a chamfer or bevel on the end of the cable jacket as shown in Figure 2.

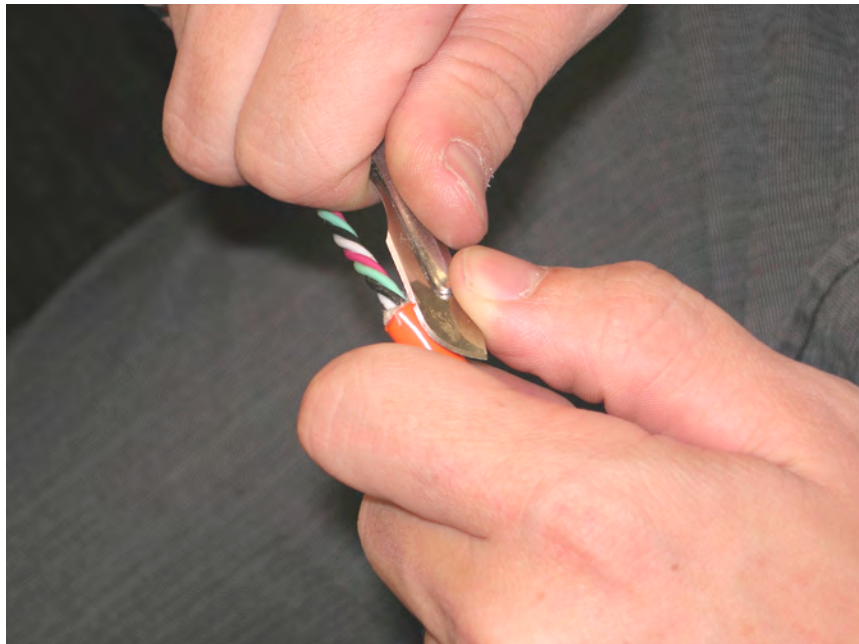


Figure 2: Chamfering cable jacket.

4. Inspect the supplied MHDG-4-CCP connector assembly. The pigtailed conductors are about 12 inches long (Figure 3). Make sure the silicone potting is intact and comes up above the top of the connector shell (Figure 4).

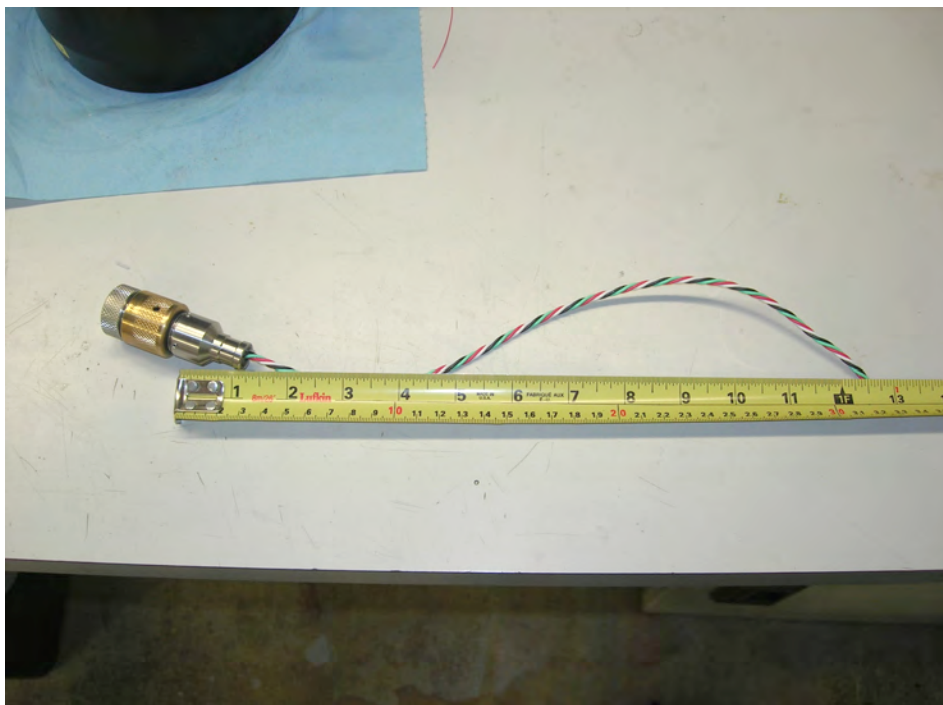


Figure 3: Connector pigtail.



Figure 4: Connector Silicone detail.

5. Disassemble the termination by cutting the two cable zip ties that hold the latex tube in place, making sure not to damage the latex tube. Slide the Morrison seal housing assembly up the cable (Figure 5). No disassembly of the Morrison seal housing is required for re-termination. Gently pull the latex tube off the underwater connector and slide the latex tube up the cable exposing the conductors. To remove the connector from the cable, either cut the heat shrink off the conductors and de-solder the connections; or, cut the conductors just on the connector side of the connections.

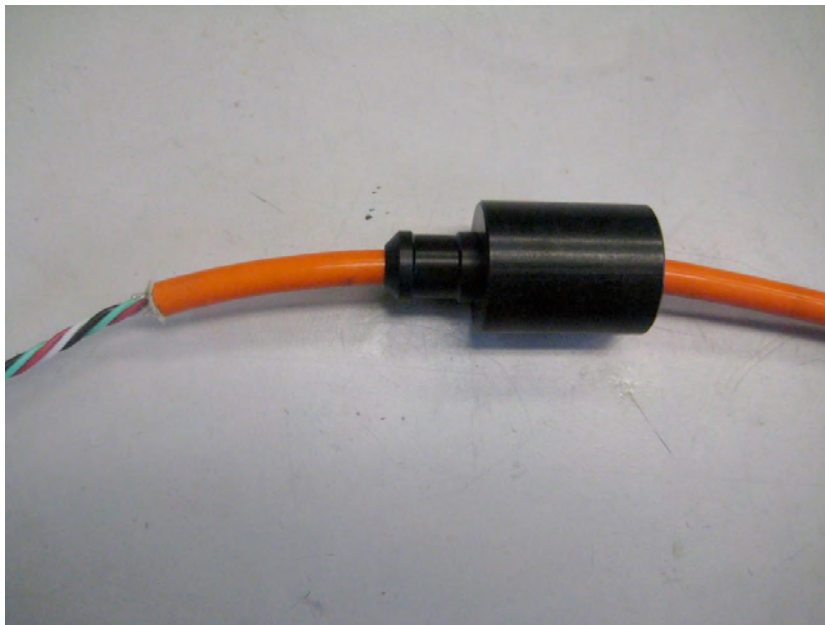


Figure 5: Morrison seal assembly on cable.

6. If the cable has been cut, or the black plastic Morrison seal assembly needs to be replaced it may be necessary to size the Morrison seal housing to the cable. Note: This is only necessary should the cable diameter at the new re-termination location is larger than the housing bore. To fit the housing to the cable, the housing will have to be drilled out until the fitting assembly just fits over the cable. To disassemble the Morrison seal housing from the seal itself and the retaining washer:

- a. Remove the snap ring from the Morrison seal assembly. This will require snap ring pliers or a small set of needle-nosed pliers for the retaining ring seen in Figure 6. The washer is now free and can be removed by hand.
- b. Remove the Morrison seal using a blunt object (a 3/16 in Allen key wrench with a blunt end works well) and take care to ensure there are no scratches on the inside sealing surface of the housing or tears/cuts to the Morrison seal. Insert the blunt object into the Morrison seal hole, and slowly pry the seal out of the housing (as shown in Figure 7).

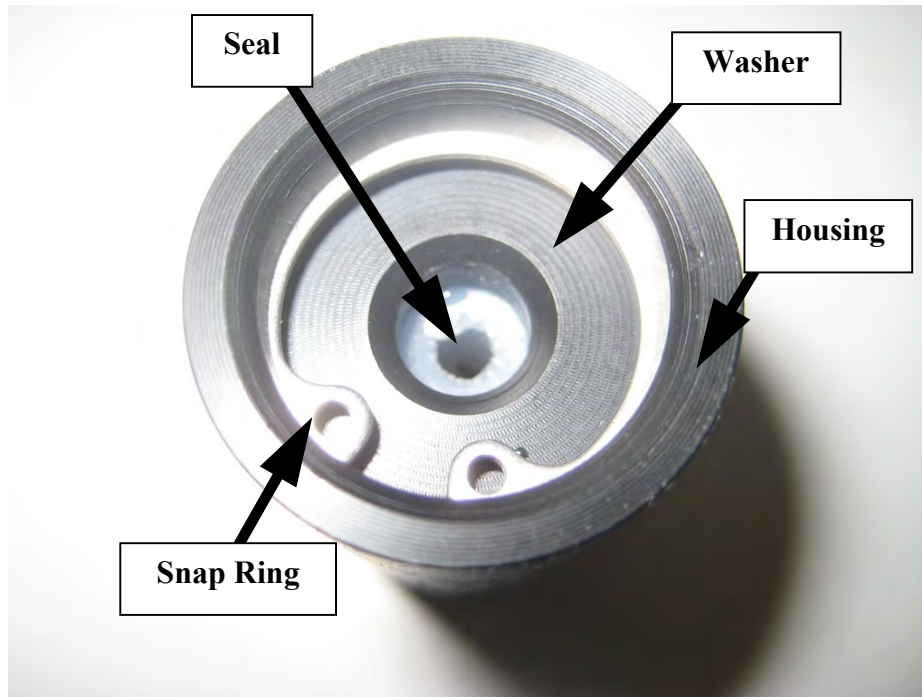


Figure 6: Assembled Morrison seal.



Figure 7: Removing Morrison seal.

7. Ensure that the Morrison seal and the housing are clean, free of debris and apply o-ring grease to the outside of the Morrison seal and the inside sealing surface of the Delrin housing. Insert the Morrison seal by hand, pushing the seal to the bottom of the housing. Insert the Delrin washer and snap ring.
8. Apply o-ring grease to the outer cable jacket and slide the seal assembly over the cable oriented with the seal end being inserted first (see Figure 5).
9. Trim the cable and connector conductors so that they will form staggered solder joints. For example, on the cable trim the white wire 1 inch, the green wire 2/3 inch, the red wire 1/3 inch and don't trim the black wire. On the connector side, trim the black wire 1 inch, the red wire 2/3 inch and the green wire 1/3 inch and don't trim the white wire.
10. Strip ¼ inch (6.5mm) of insulation off all the wires.
11. Using a soldering iron and electronics solder (63/37), tin the four cable wires and the four connector wires.
12. Put four pieces of heat shrink on the wires, either the cable or connector side (Figure 8).

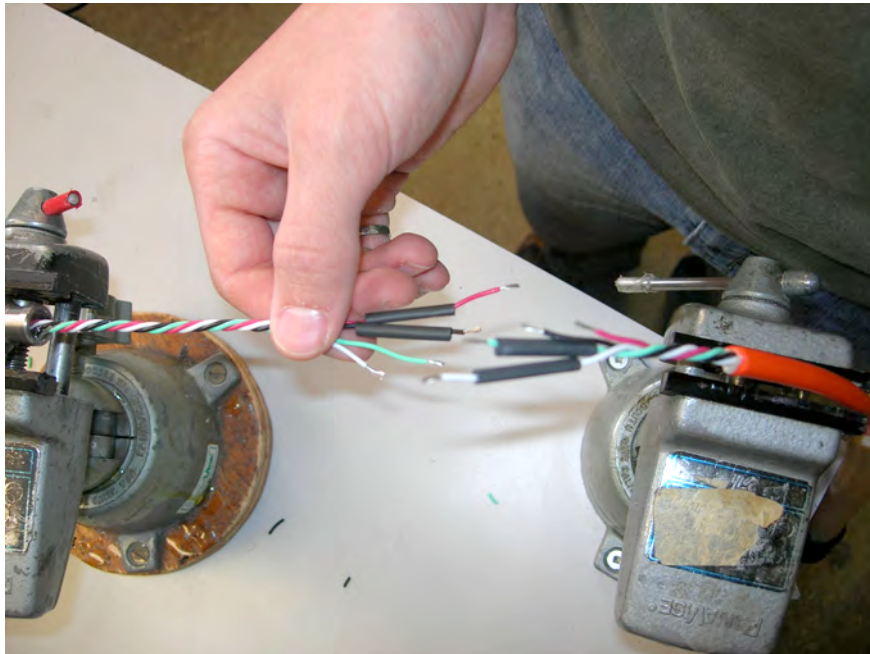


Figure 8: Wires prepared for soldering.

13. We recommend using two vises to hold the assembly while soldering the wires together as shown in Figure 8.

14. Align the wires and solder (Figure 9). Making sure you match the colours (white – white, etc.)



Figure 9: Soldering wires.

15. Slip the heat shrink over the solder joints and seal with a heat gun (Figure 10)

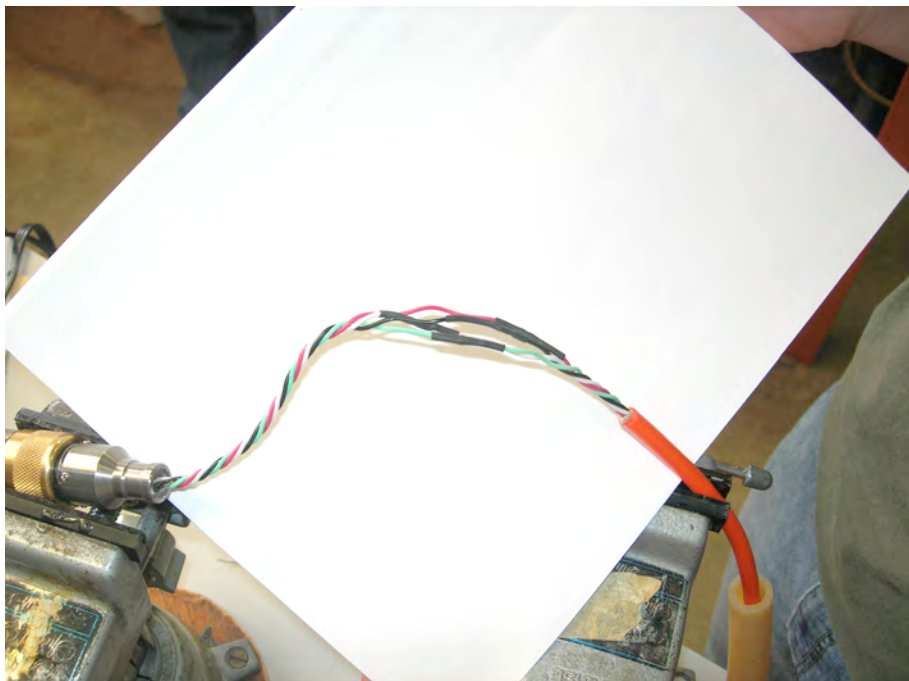


Figure 10: Heat shrink on solder joints.

16. Shorten the soldered wires by putting a small loop at the connector end as shown in Figure 11.



Figure 11: Loop in wires.

17. Slide the latex tube and fitting assembly down the cable and over the soldered connection (Figure 12). Put some o-ring grease onto the wires to ease assembly.



Figure 12: Latex tube installation.

18. Mark the position where the seal assembly will require being located on the cable when the tether termination is fully assembled. Apply a couple of wraps of electrical tape (or glue lined heat shrink as an alternative) around the cable to act as a stop for the Morrison seal assembly (see Figure 13). Slide the Morrison seal assembly down the cable so that it is in the correct spot for the latex tube to fit over the barb.



Figure 13: Electrical tape applied as a stop for the Morrison seal assembly.

19. After repeated re-termination, the Morrison seal may show signs of damage (i.e. chunks taken out near either end of the hole and is caused from the cable being repeatedly inserted). This damage is shown in Figure 14. This damage will not affect the seal if the hole shows no damage along the middle surface of the hole. This is an advantage of the Morrison seal design. The design involves a very wide sealing surface compared to an o-ring. However, if the seal is damaged throughout the entire hole, replace the Morrison seal.

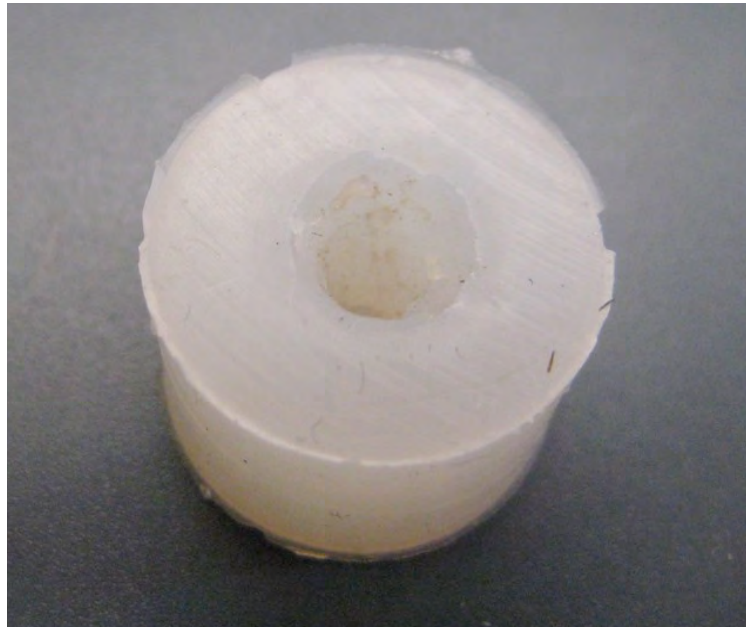


Figure 14: Partially damaged Morrison seal end.

20. Secure the latex tube with two 6 inch cable ties, one at each end. Pull these as tight as possible and then trim off the excess tails with a pair of flush cutters (Figure 15).

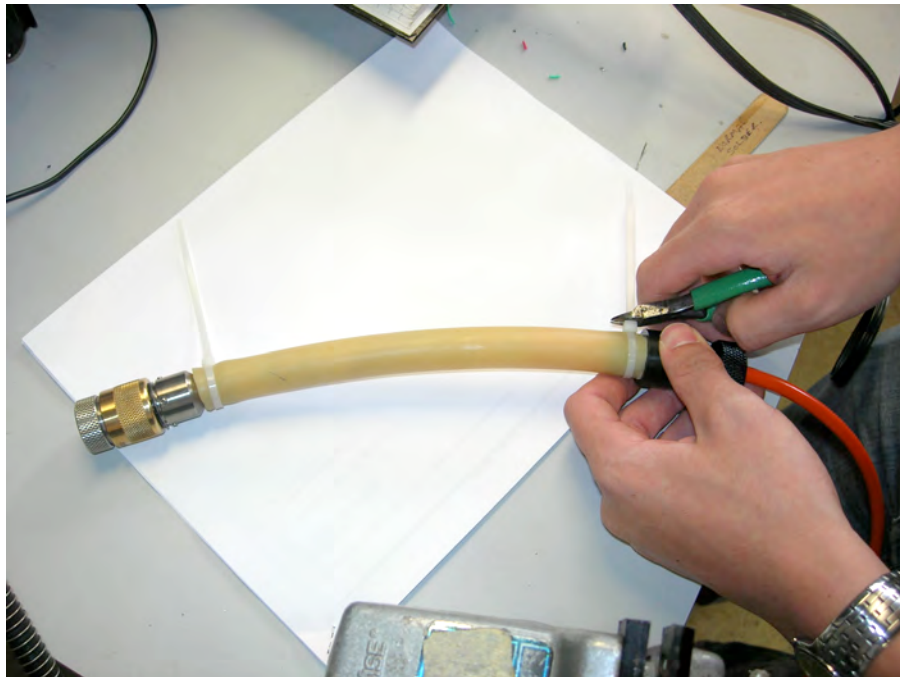


Figure 15: Trimming cable tie tails.



Figure 16: Latex tube installed and seated.

21. Plug the cable into the VMP and check communications.