

Control Board to Diaphragm  
Pump Cable



# Materials

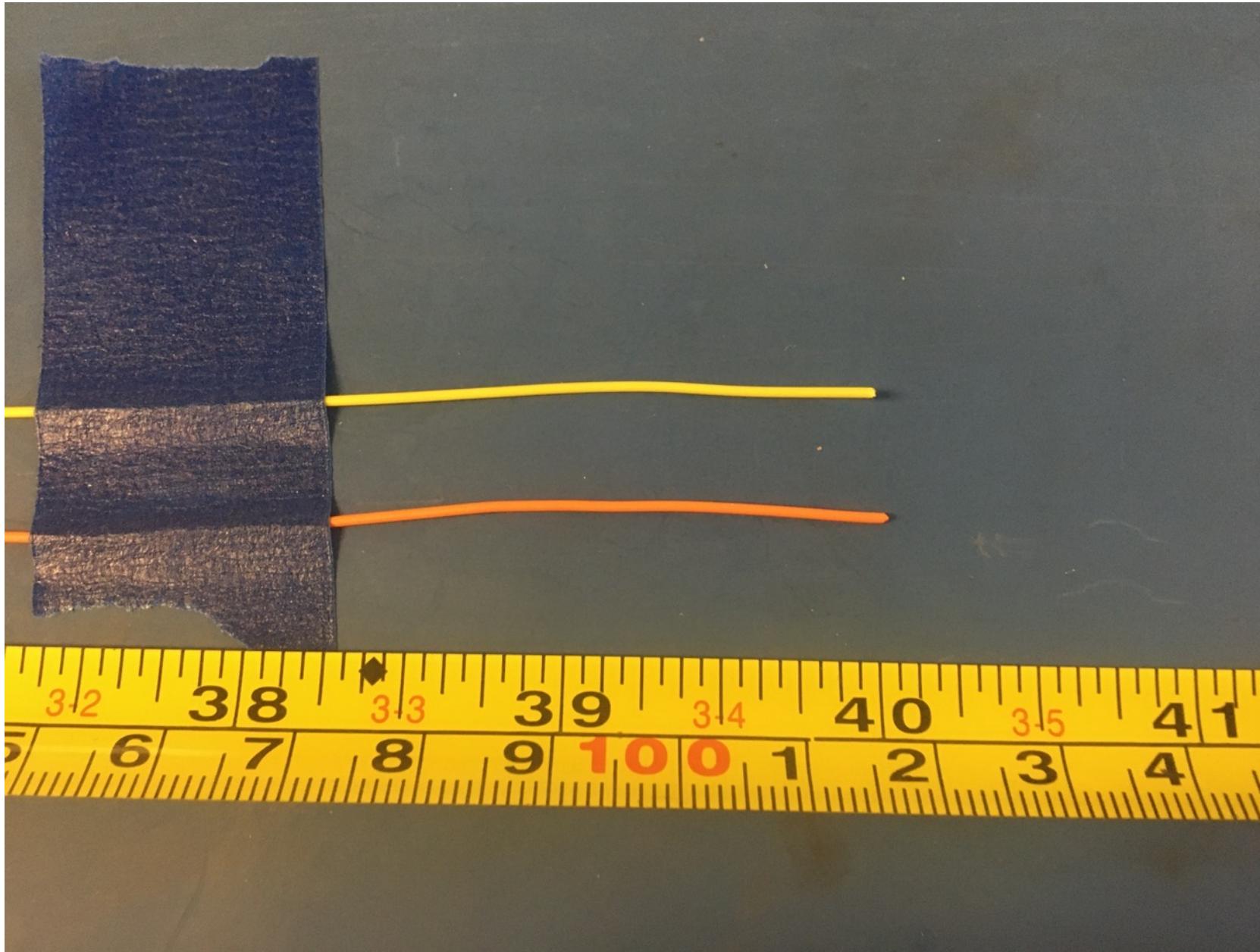


Tools

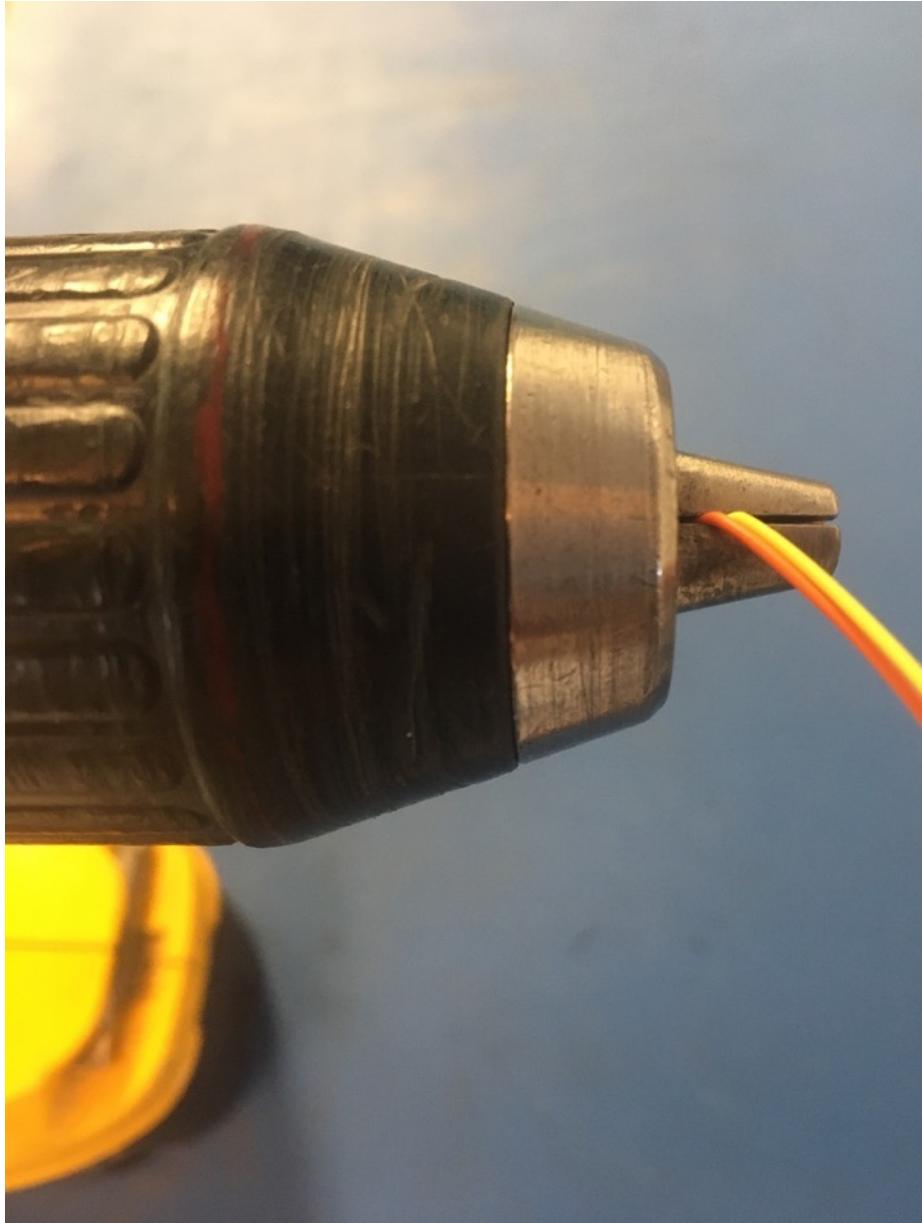
# D sub Crimp Tool



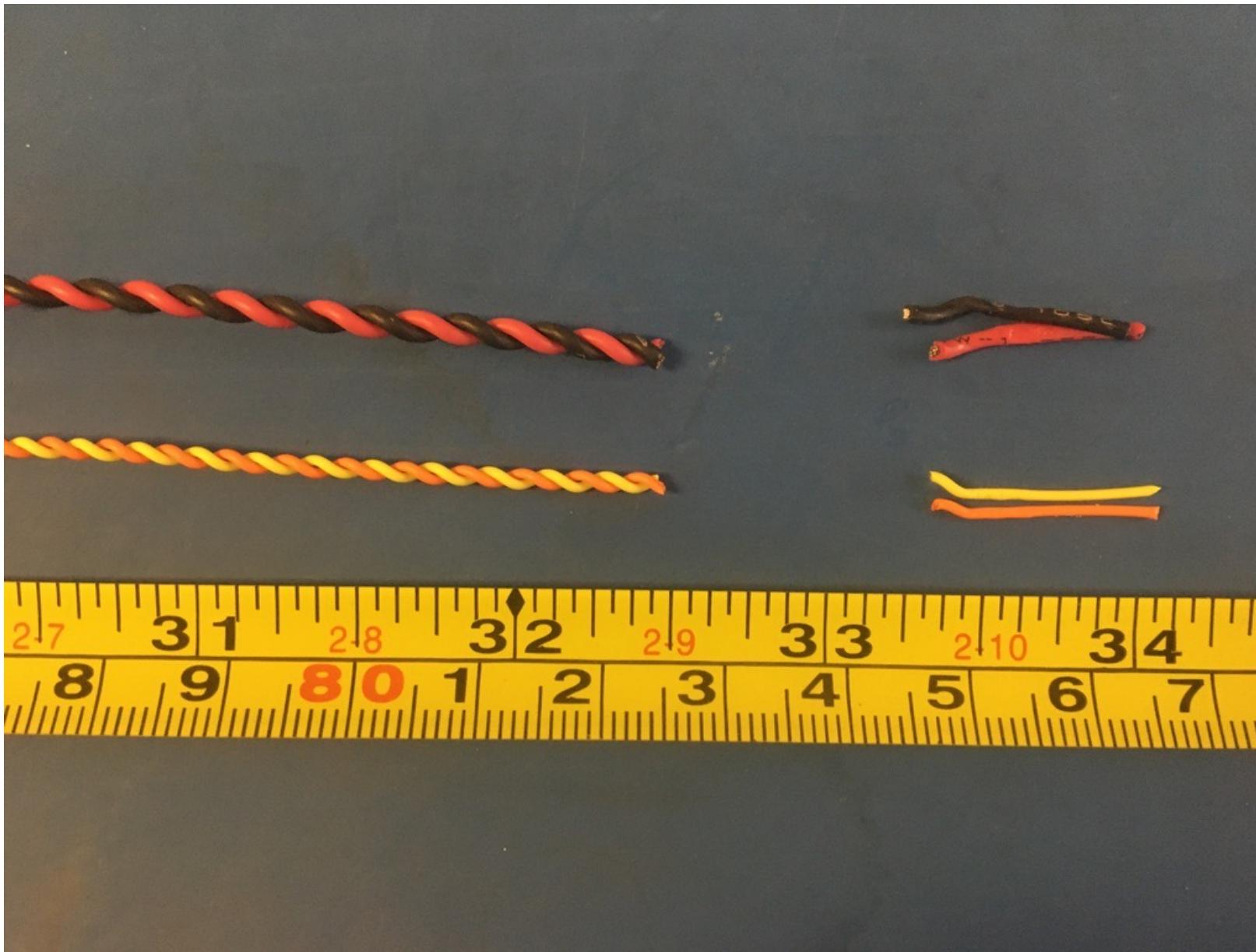
Measure out and cut 40 inches of yellow and orange 28 awg wire as well as black and red 20 awg wire.

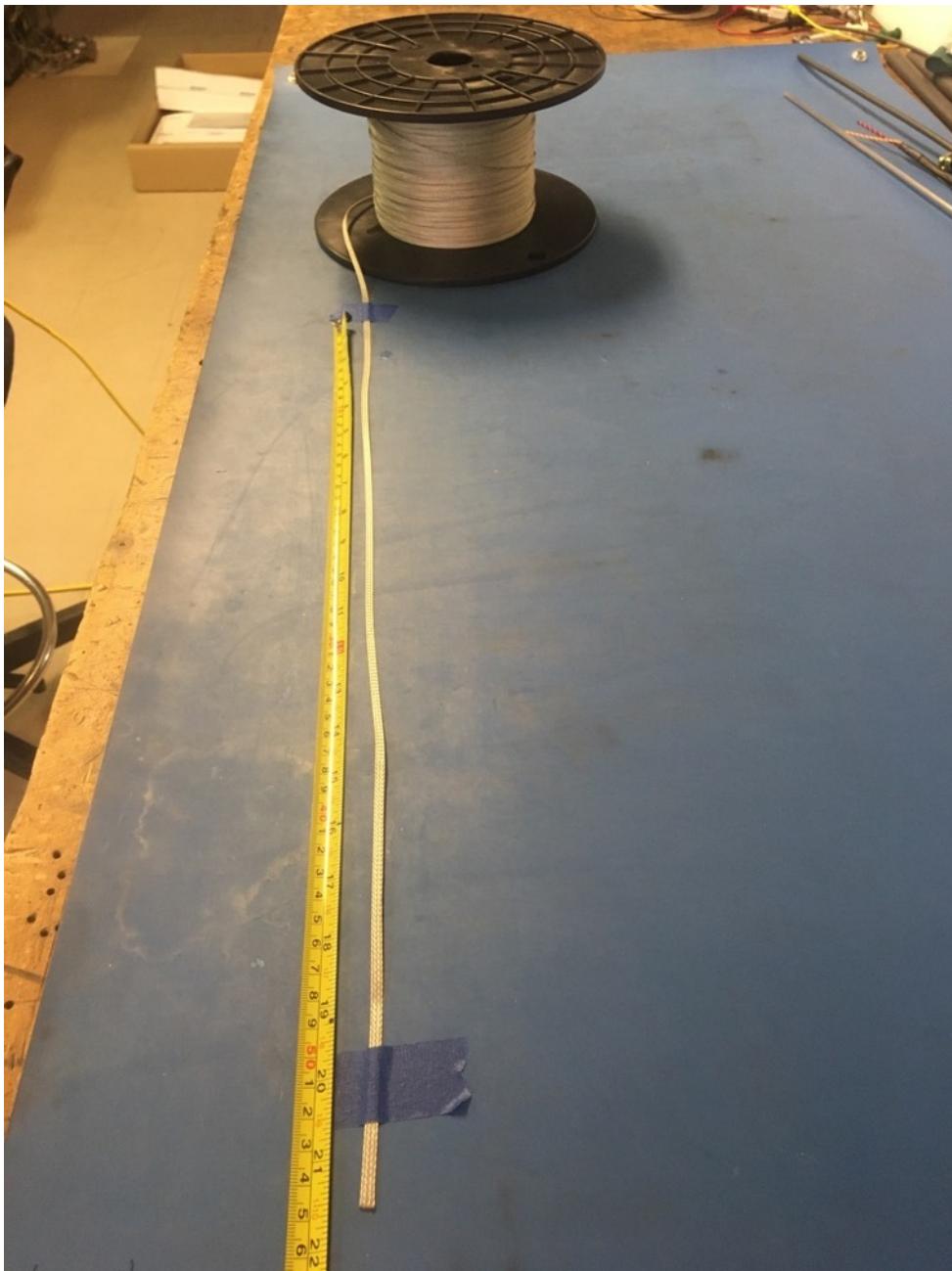


To make the twisted pairs, line the vise with masking tape. Put one end of the yellow and orange wires into the vise and the other into the drill.  
Run the drill till the wires are sufficiently twisted (for reference see the next slide). Repeat with the black and red wires.



Trim the ends of each twisted pairs where they were in the vise and drill. Once trimmed they should measure about 32.5 inches.





Measure out 21.5 inches of the 1/8<sup>th</sup> metal braid. Expand it using the metal rod.



Put the twisted wires into the expanded metal braid. 2.5 inches of the twisted wires should stick out from the metal braid on one end.



Measure out and cut two lengths of 4.8mm adhesive shrink tube each .5in long.



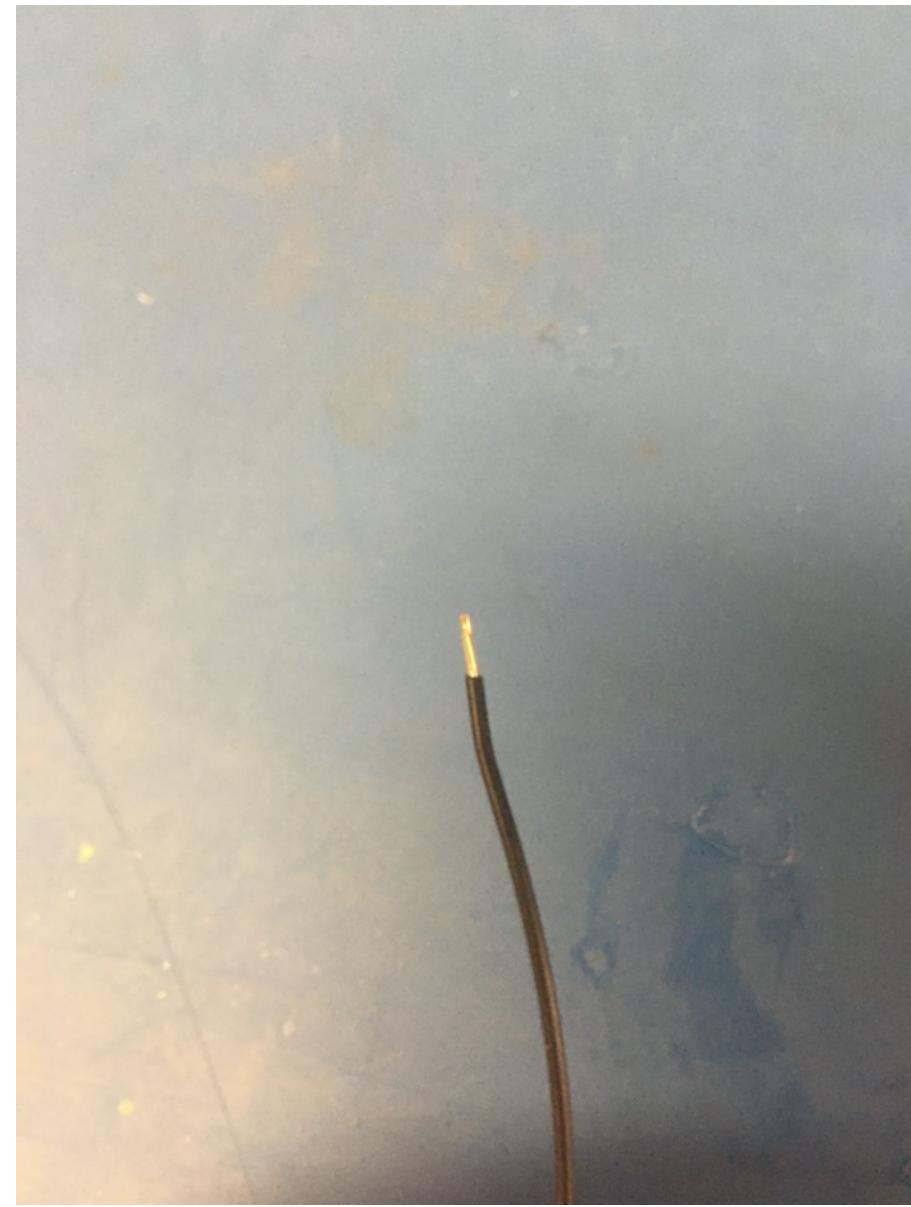
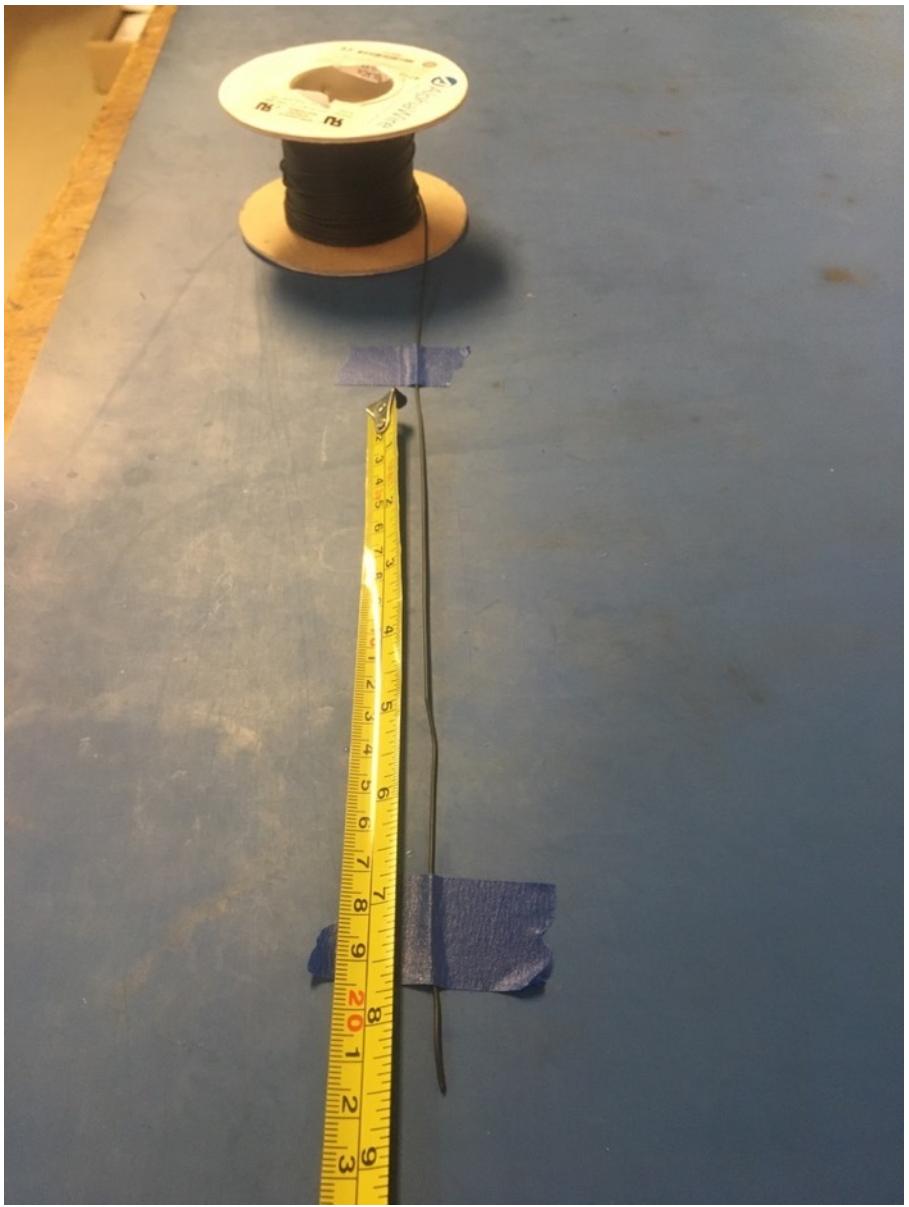
Put one of the pieces of the shrink tube onto the end of the metal braid where the wires measured 2.5 inches. Place the shrink tube such that the metal braid ends midway through it. The wires should now measure 2.25 inches long. Apply the heat gun to the shrink tube.



Repeat the process on the previous slide on the other end of the metal braid (though the wire does not need to be measured this time). Thus far, the wire harness should appear as shown on the right.



Measure out and cut 8.5 inches of black 24 awg wire. Strip 3-4mm off one end.

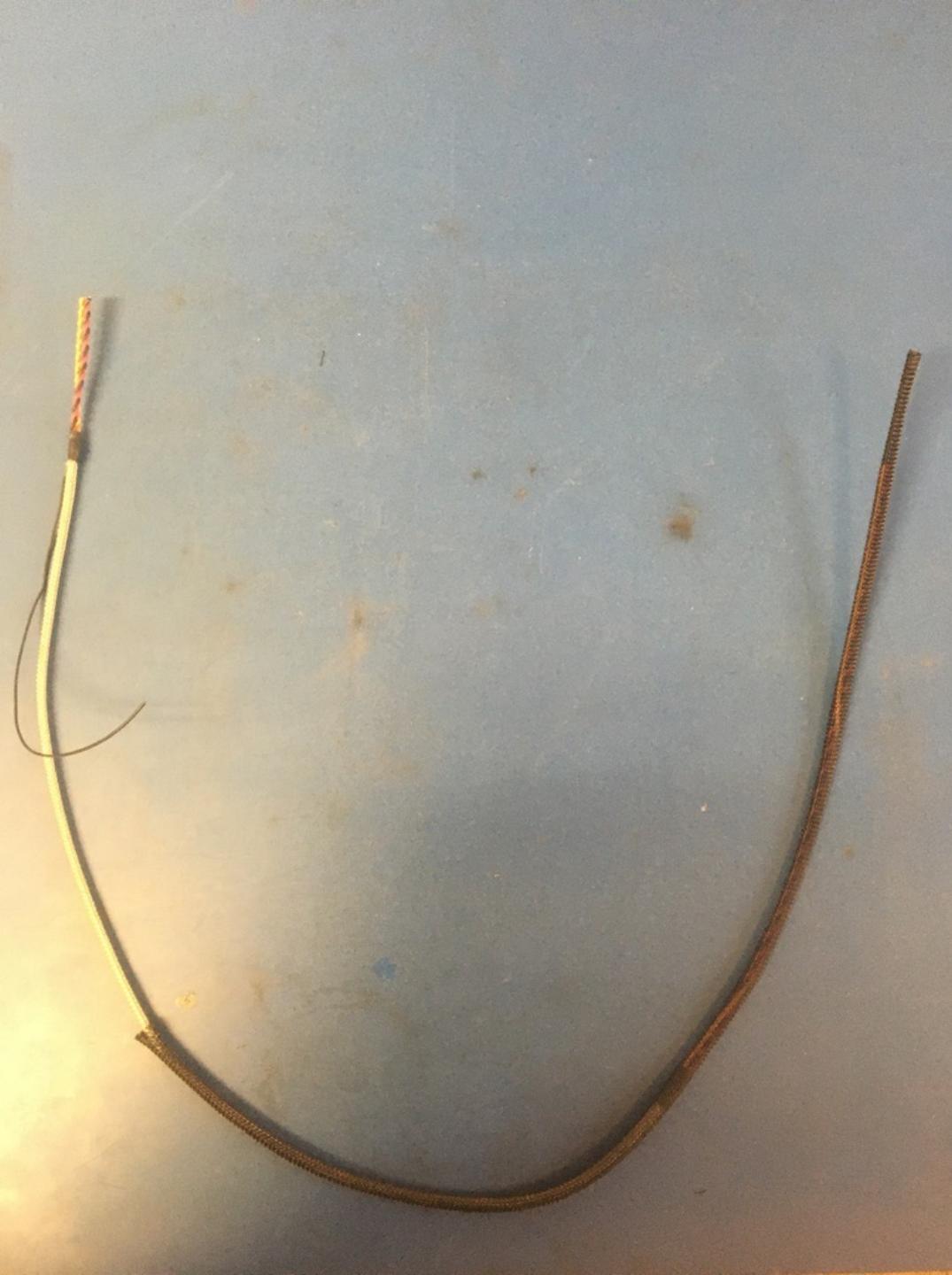


Solder the stripped end of the black wire onto the metal braid near the shrink tube joint with the shorter length of wire (the end that was measured to be 2.25 inches). The black wire should be soldered so the that its length runs with that of the metal braid.





Measure out and cut 20.5 inches of 1/4<sup>th</sup> plastic braid.



Put the plastic braid onto the wire harness. It does not matter from which end.

Thread the ground wire through one of the holes in the plastic braid so it appears as shown of the left. At each end of the harness, the plastic braid should end midway through the metal shrink tube joints.



Measure out and cut one length of 6.4mm adhesive shrink tube that is 1in long.



Place the piece of shrink tube onto the ground wire end of the harness. The shrink tube should be placed such that it covers the solder joint and the length of the metal braid shrink tube. Apply the heat gun.



Measure out and cut one length of 6.4mm adhesive shrink tube that is .5in long.



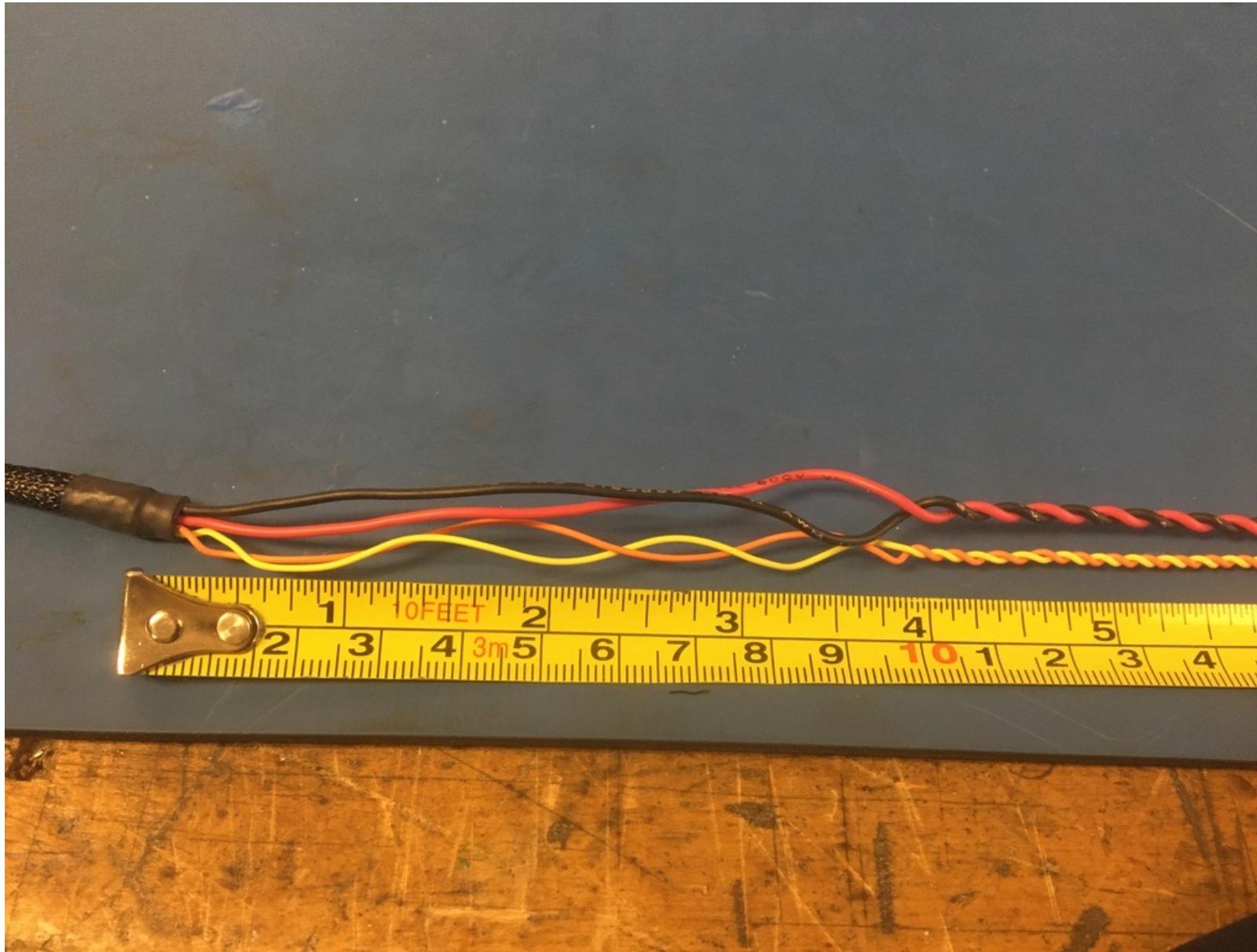
Place the piece of shrink tube onto the plastic braid end without the ground wire. The plastic braid should end midway through the piece of shrink tube. Apply the heat gun.



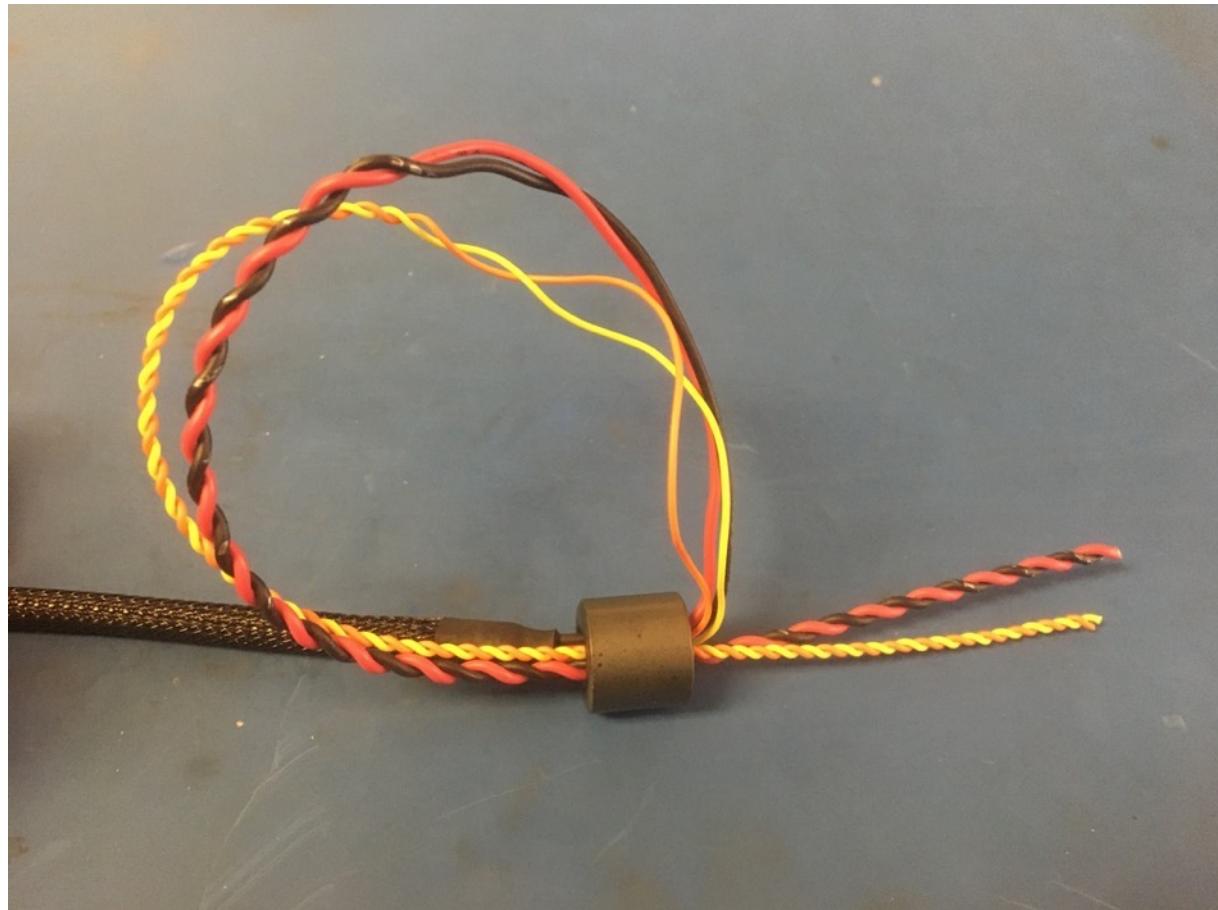


So far, the wire harness should appear as shown on the left.

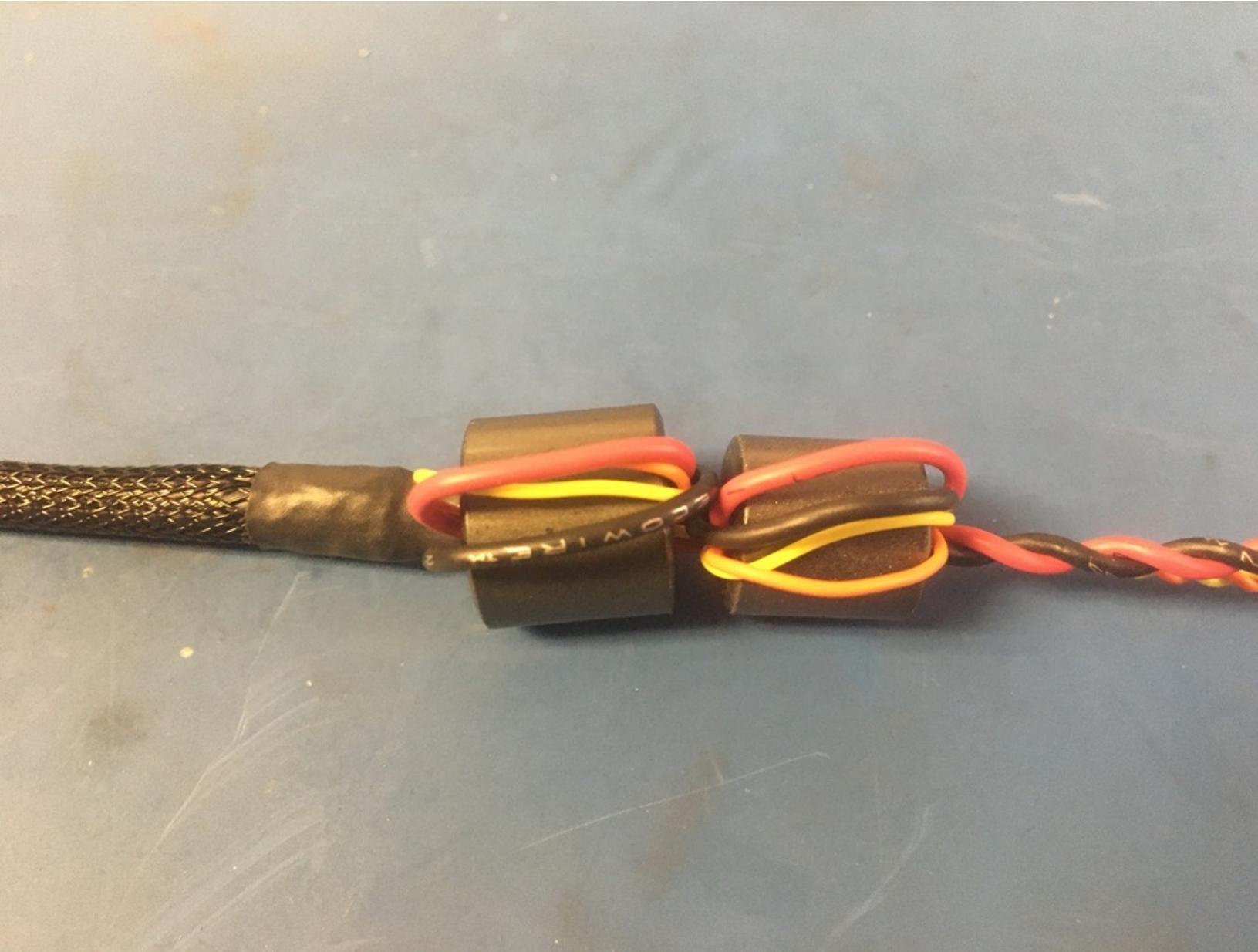
Take the end of the harness without the ground wire and untwist about 4in of the twisted pairs.



Thread the 75 magnet onto the end of the harness that was just untwisted. Then thread the wires back through the bottom of the magnet as shown on the left. Pull the loop of wire taught so the 75 magnet appears as shown on the right. Repeat this process with the 43 magnet. It may be necessary to untwist more wire for the 43 magnet.



Once both magnets are on the wire harness, they should appear as shown.



Measure out and cut 2in long lengths of 4.8mm and 6.4mm adhesive shrink.



Place the 4.8mm piece of shrink tube onto the wire harness such that it abuts the magnets. Apply the heat gun.



Place the 6.4mm piece of shrink tube onto the wire harness such that it layers atop the 4.8mm piece. Apply the heat gun.



Measure out and cut one length of 16mm adhesive shrink tube that is 2in long. Place the piece of 16mm shrink tube over the magnets and far enough down so that 1.75 inches of the shrink tube applied on the previous slide is visible as shown on the right.



Apply the heat gun.



Measure and cut the twisted pairs on the magnet end of the harness so that they measure 2.5 inches.



Select the D-sub shell stops. If using new D-sub shells, the smallest size is appropriate. However, if reusing old D-sub shells, use the smallest size available. Test the D-sub shell stops on each end of the wire harness. If the fit is loose, layer shrink tube until it fits more snuggly.



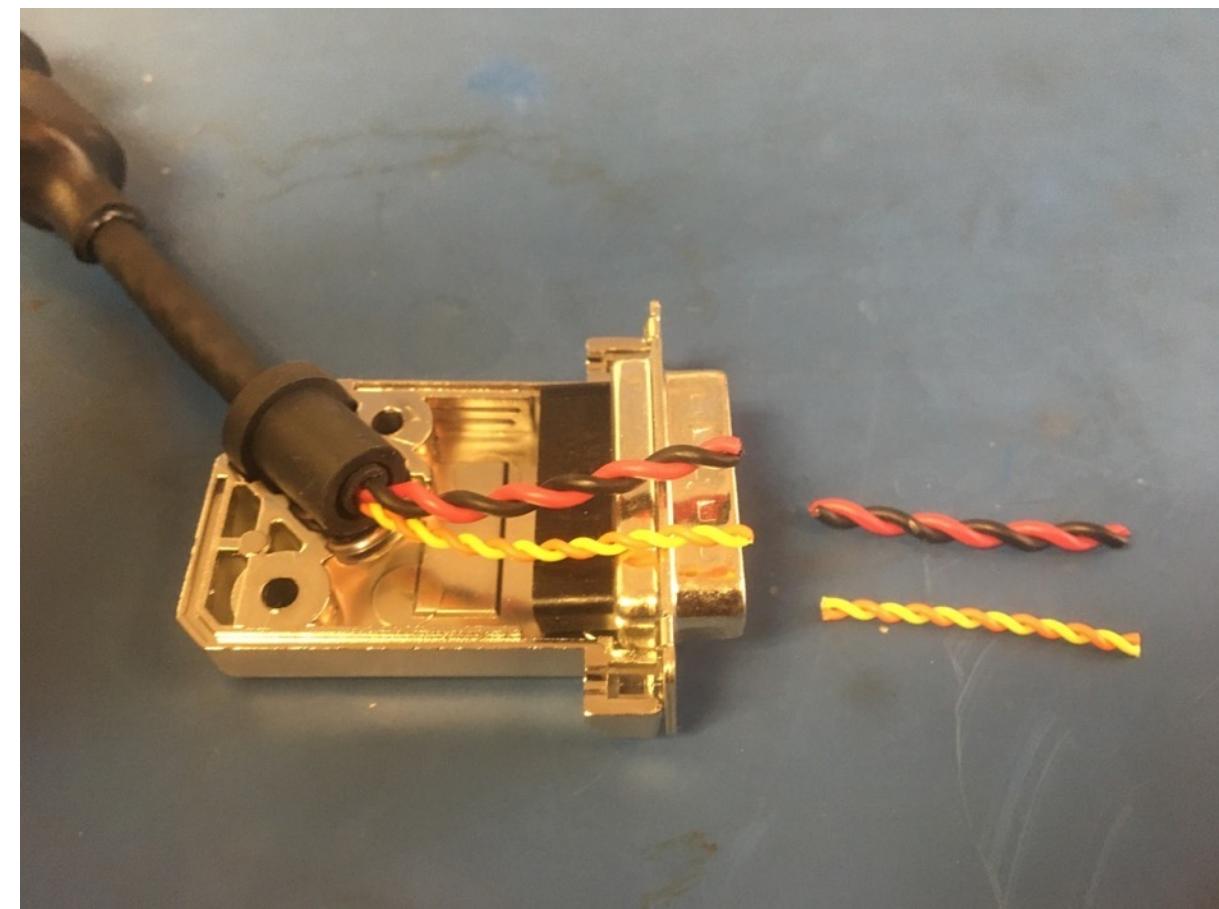
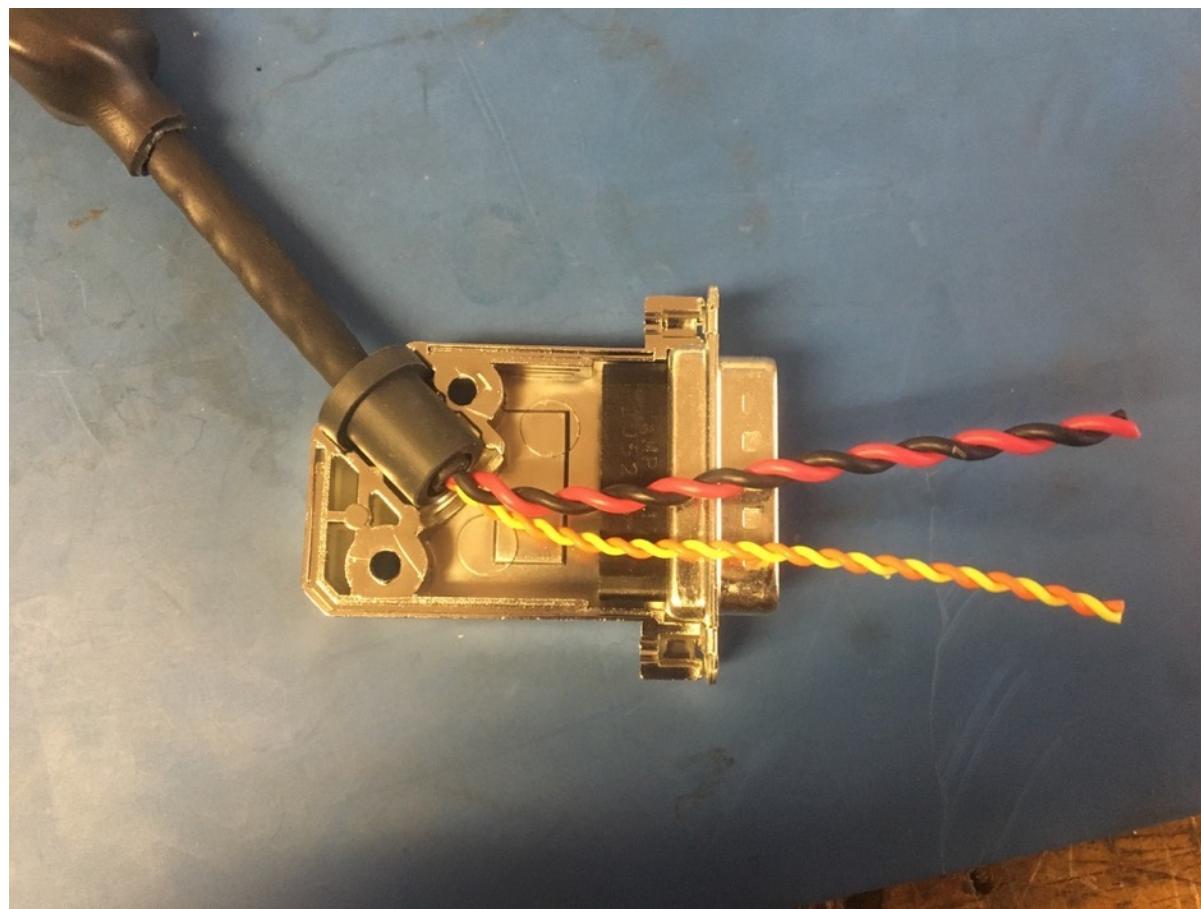
Once any additional shrink tube is added, thread the D-sub shell stop onto the magnet end of the harness and apply super glue to the end of the shrink tube as shown. Put the D-sub shell stop over the super glue and twist it around to spread the super glue inside the stop. The final position of the D-sub shell stop is as shown on the right: with the stop's end flush with that of the shrink tube.



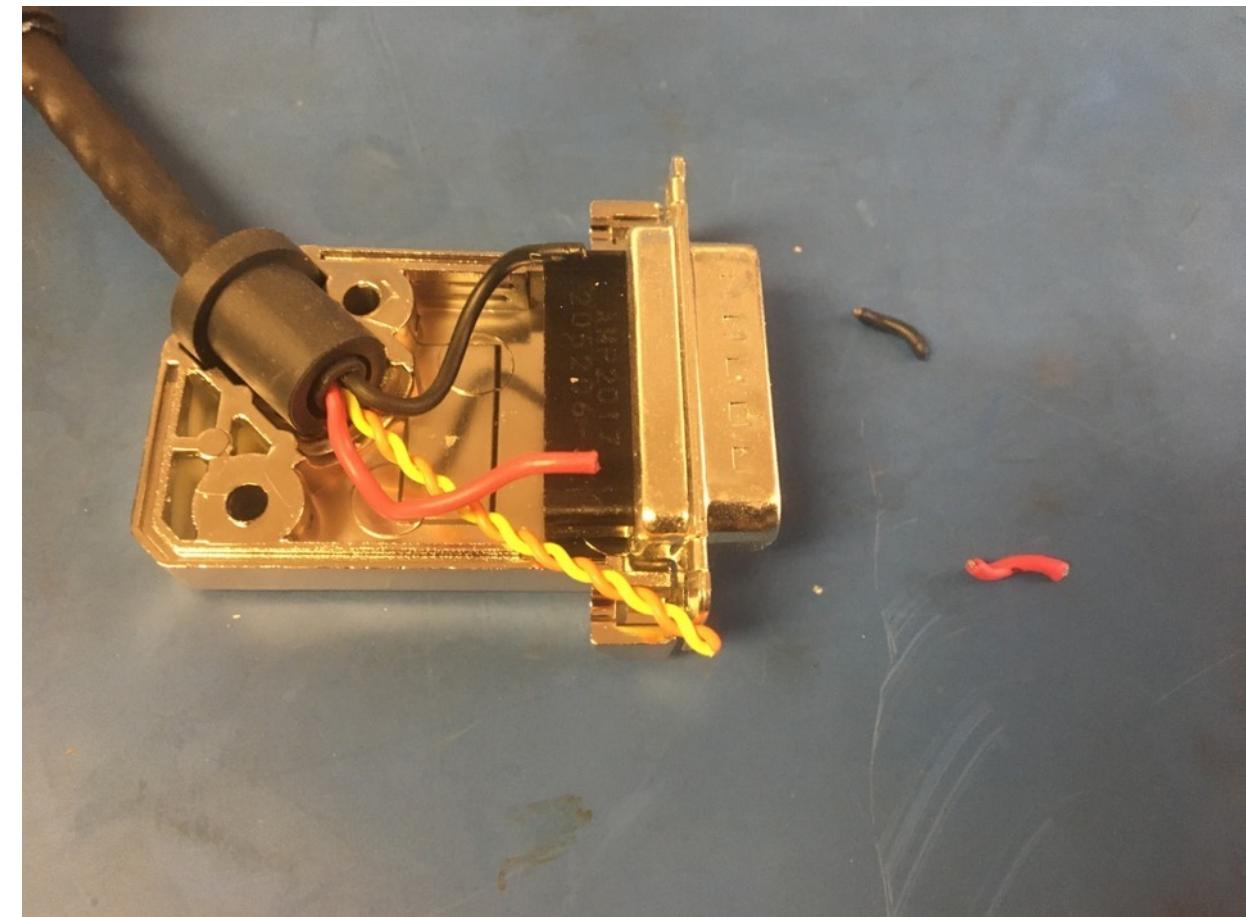
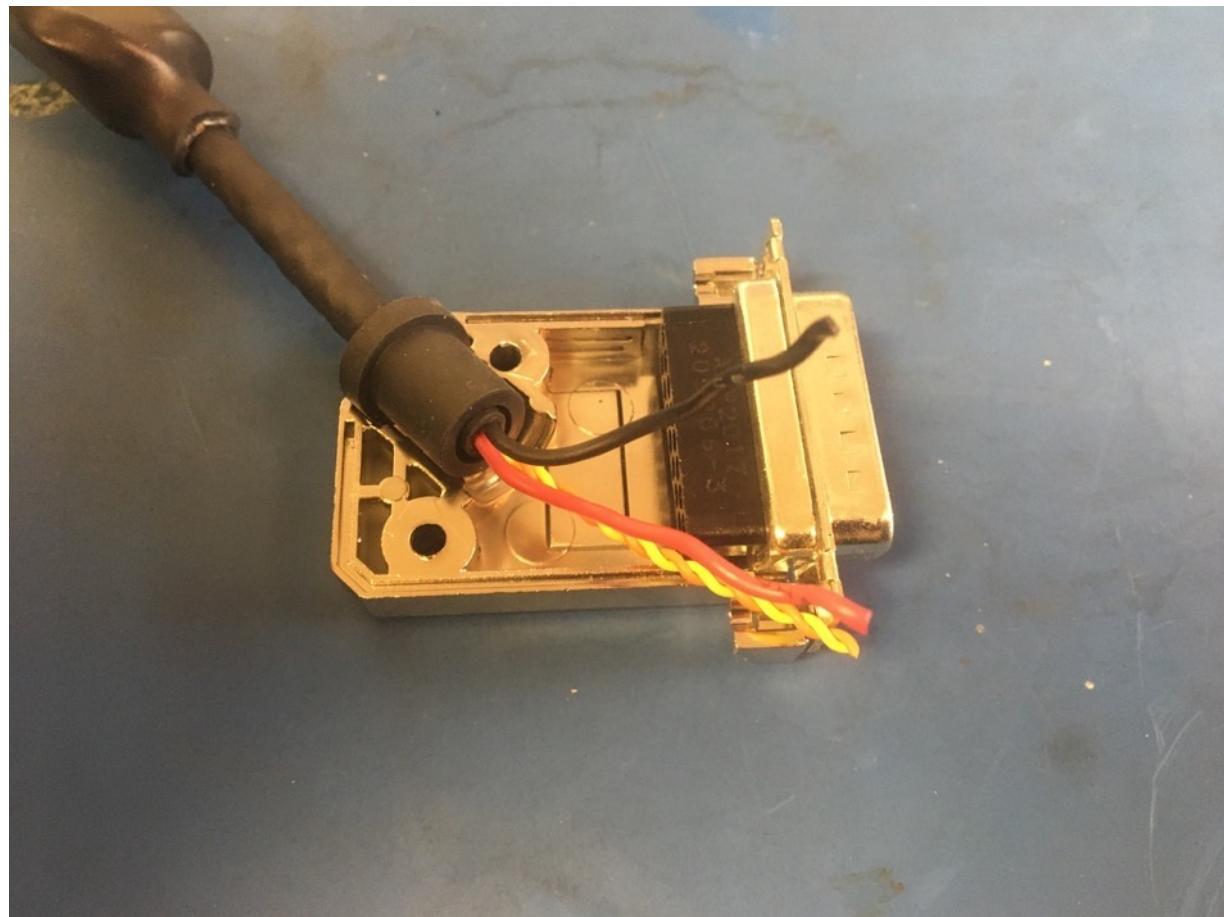
Repeat the process shown on the previous slide on the ground wire end. It's recommended that the super glue be allowed to dry before continuing as it is easy to get on one's hands.



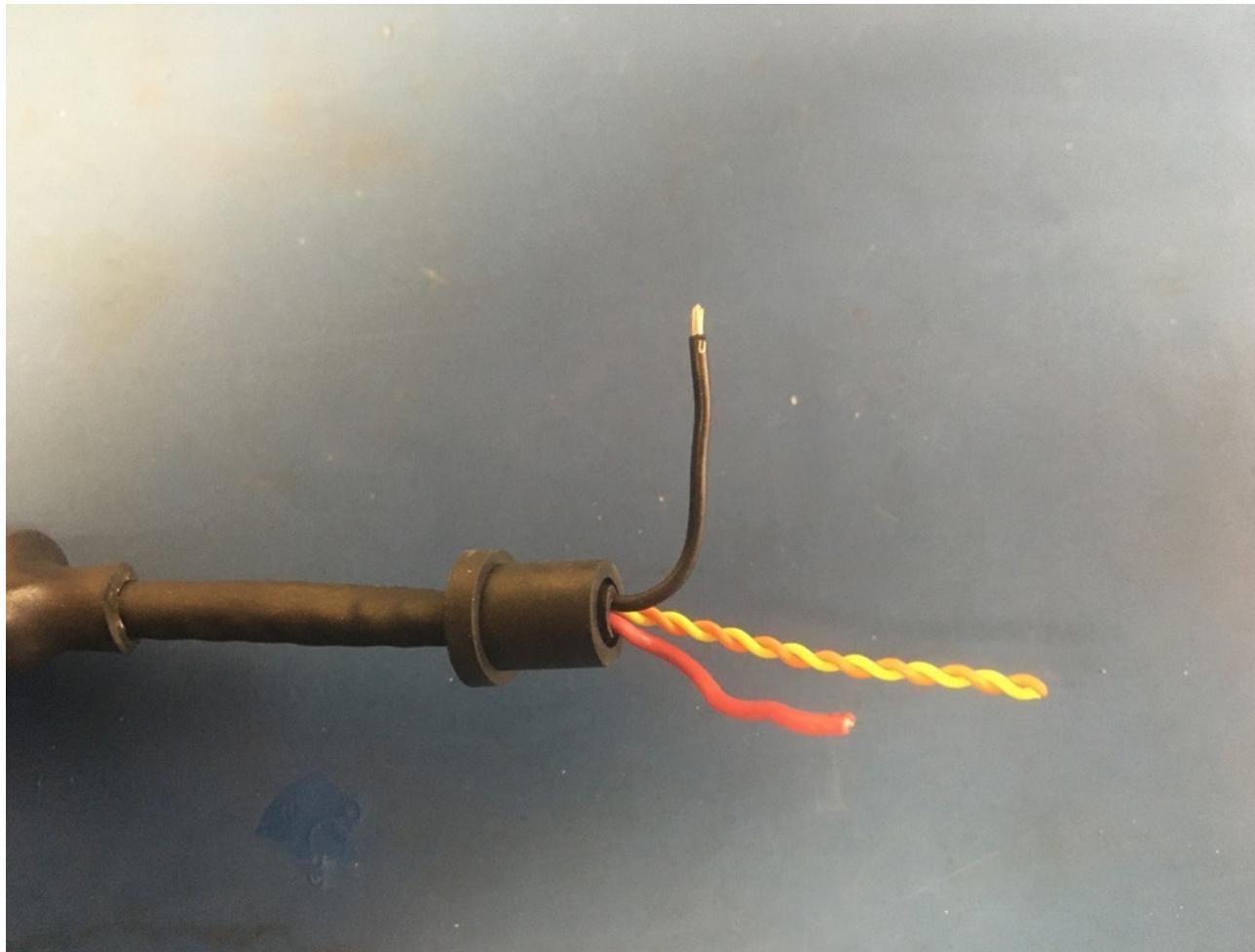
Taking the magnet end of the harness, place the D-sub shell stop into the bottom of the D-sub shell as shown. Put the 15 pin male D-sub connector into the bottom of the shell. Measure out and cut the twisted pairs so that they end at the mouth of the connector.



Untwist and straighten the red and black twisted pair. Position them as shown on the right and trim them so they end midway through the black part of the connector.



Strip about 2mm off the black wire. The D-sub crimper will be used for all the upcoming crimping, however, be sure to use the appropriate setting for the wire size. For the black and red wire, use the 20-24 awg setting.



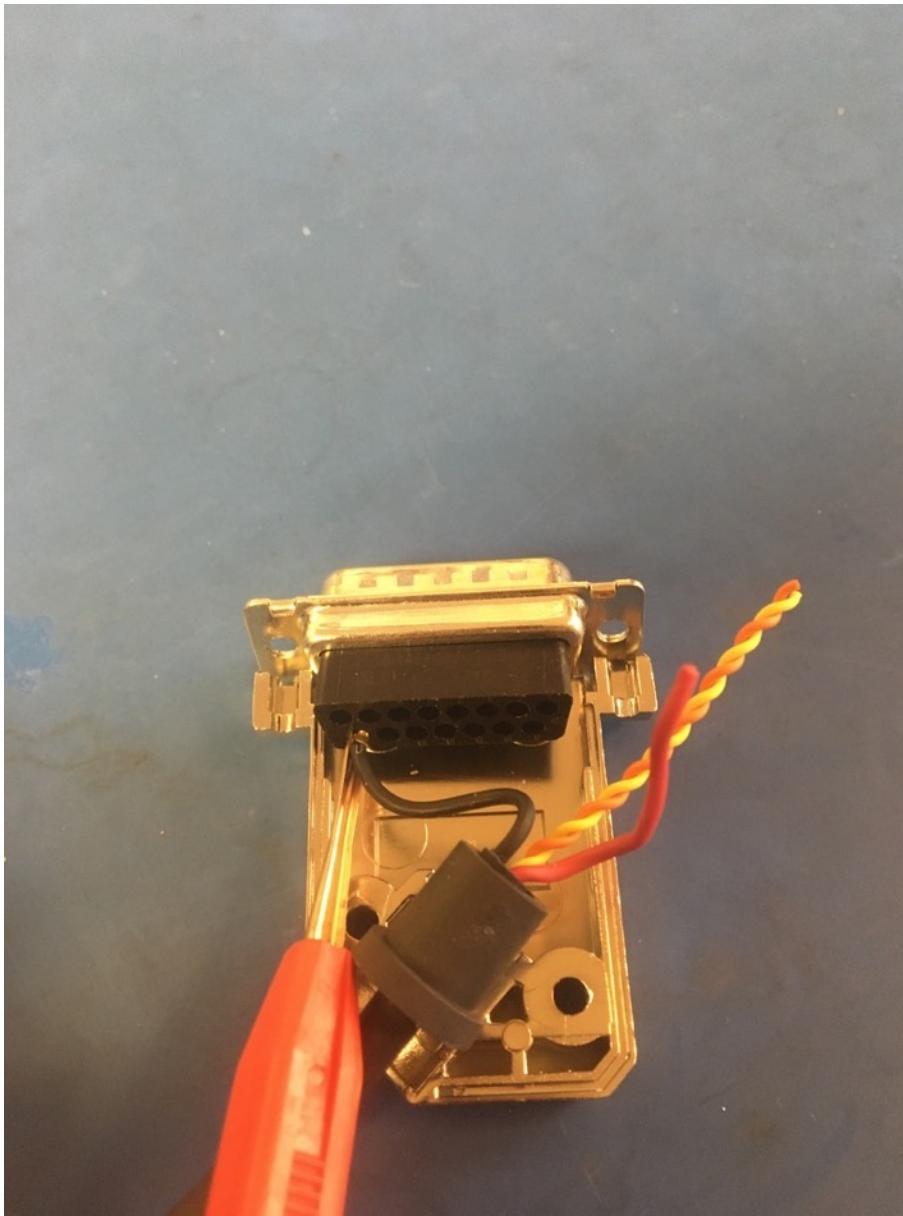


Exposed wire just visible

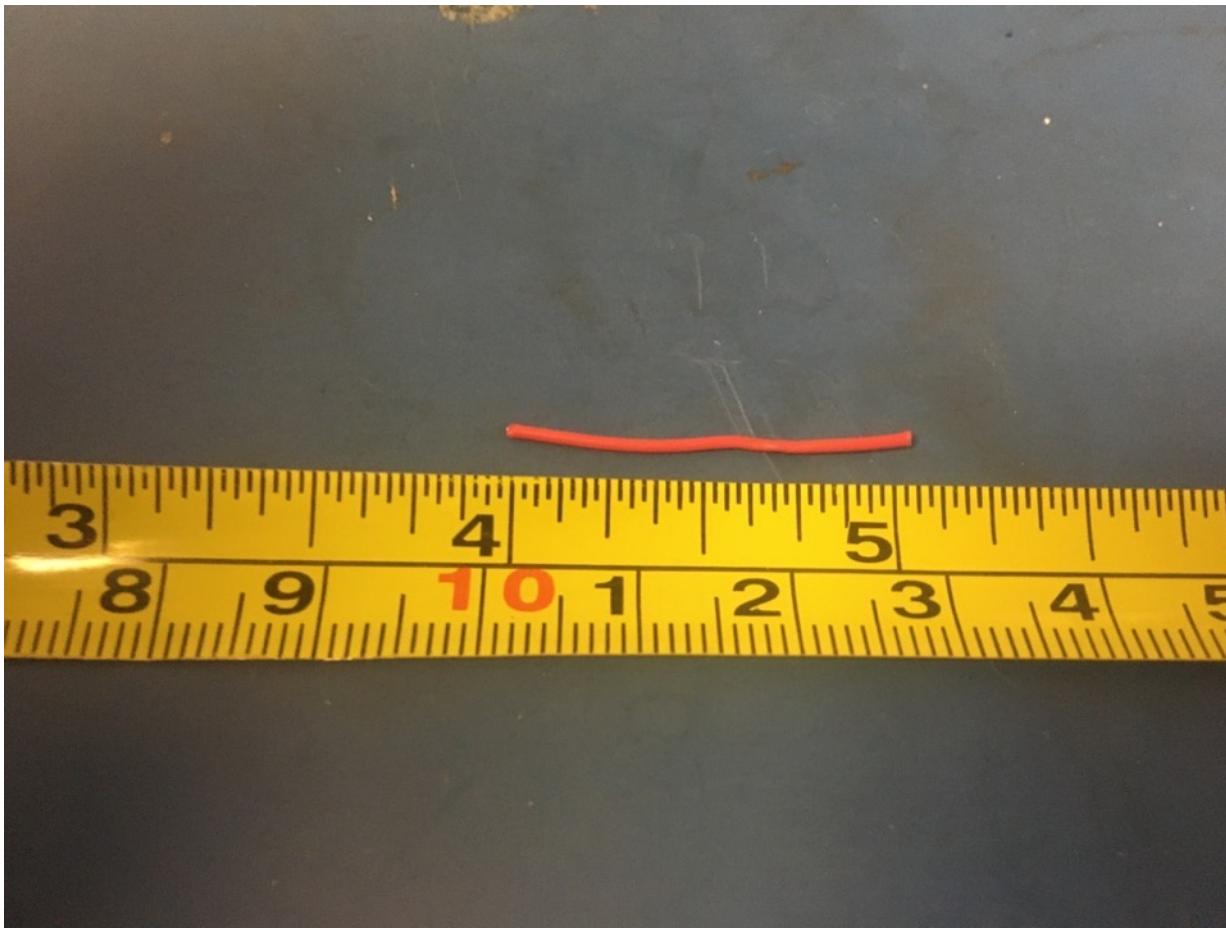
Isolation in first grip

Crimp on a 20-24 D-sub pin onto the black wire. It should be crimped such that the isolation is held by the first grip but not the second. A bit of exposed wire should also be peaking out of the top of the second grip.

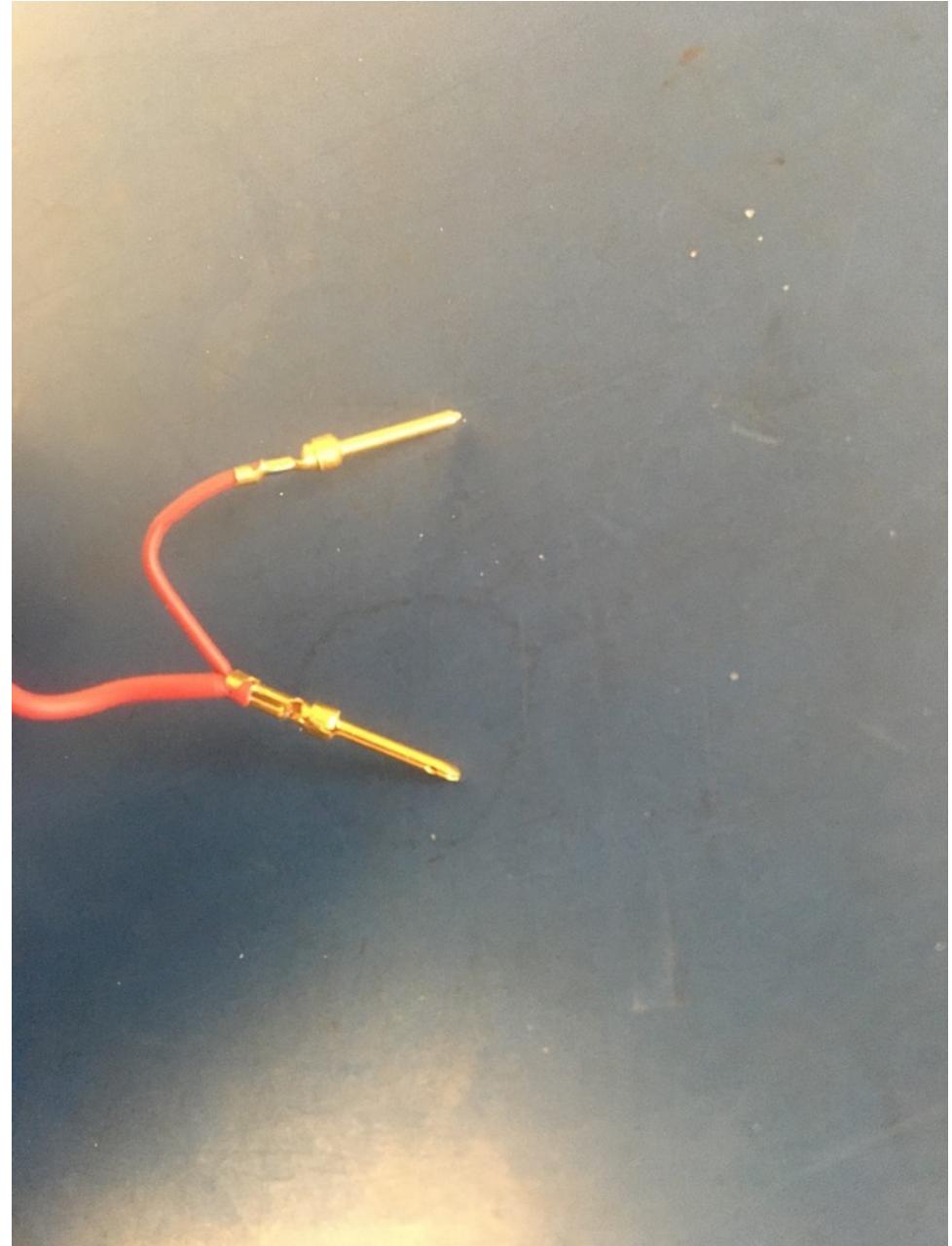
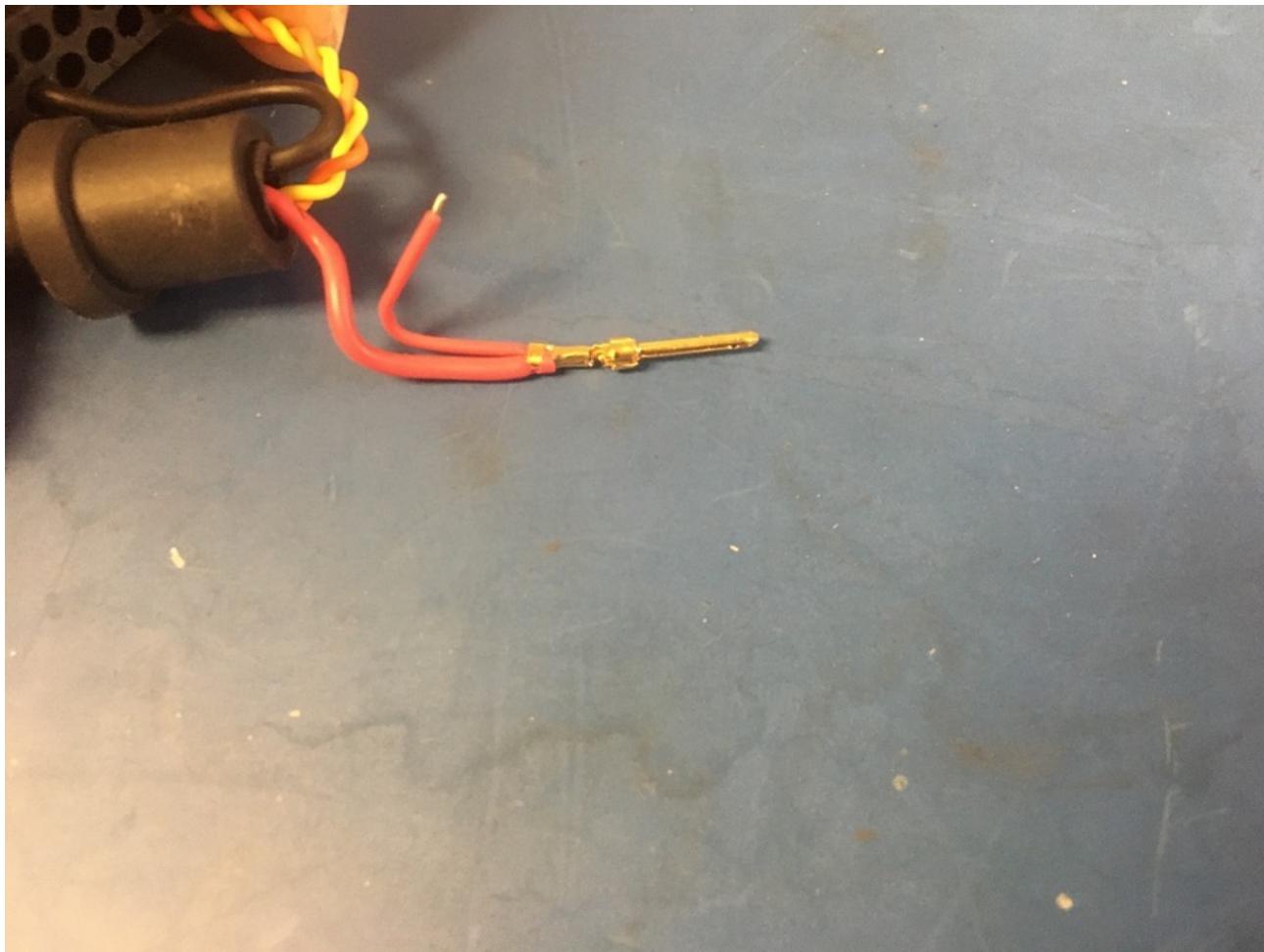
Insert the black wire using the red end of the D-sub insertion/extraction tool. The pin should feel to click once inserted all the way. Please reference the accompanying pin out document to see where each wire should go.



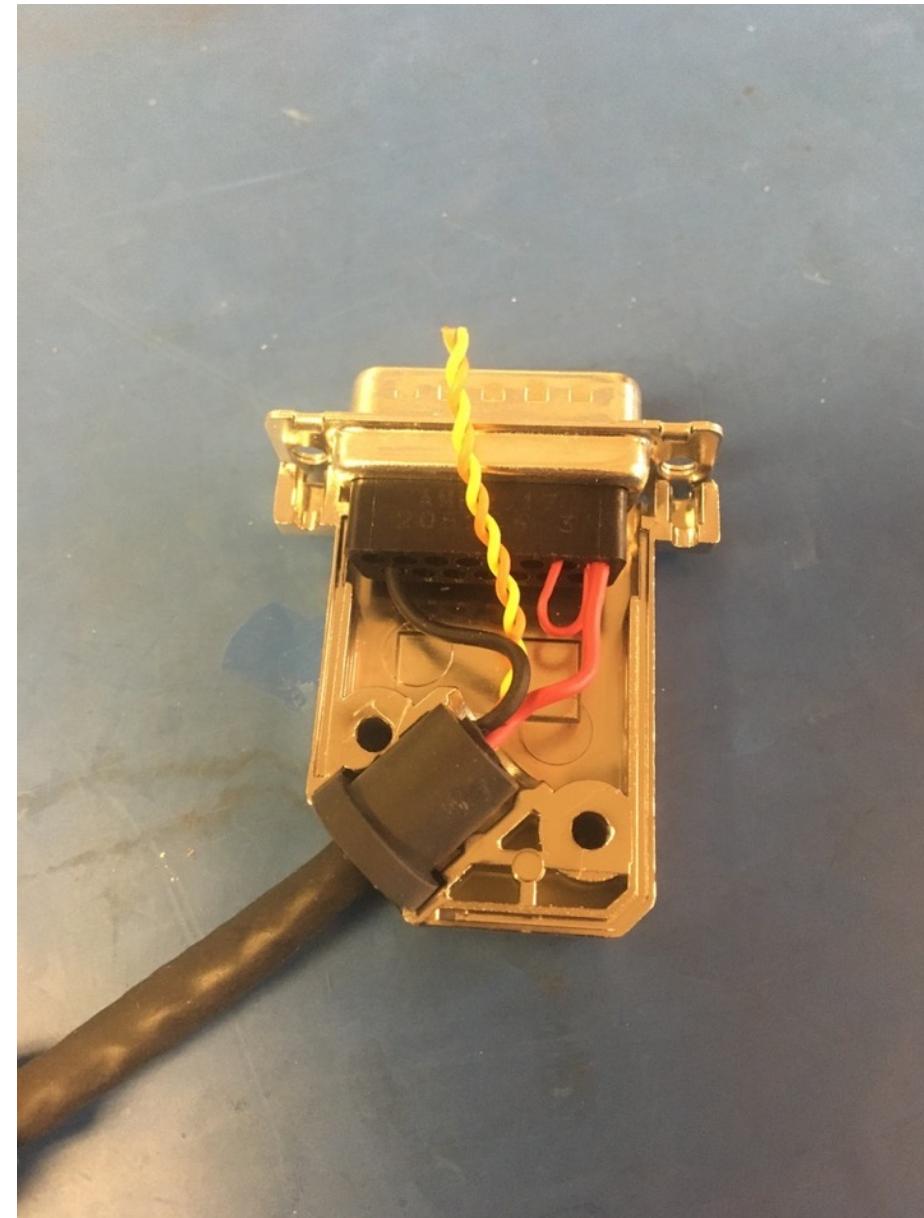
Measure out and cut 1in of 28 awg red wire. Strip about 2mm off each end.



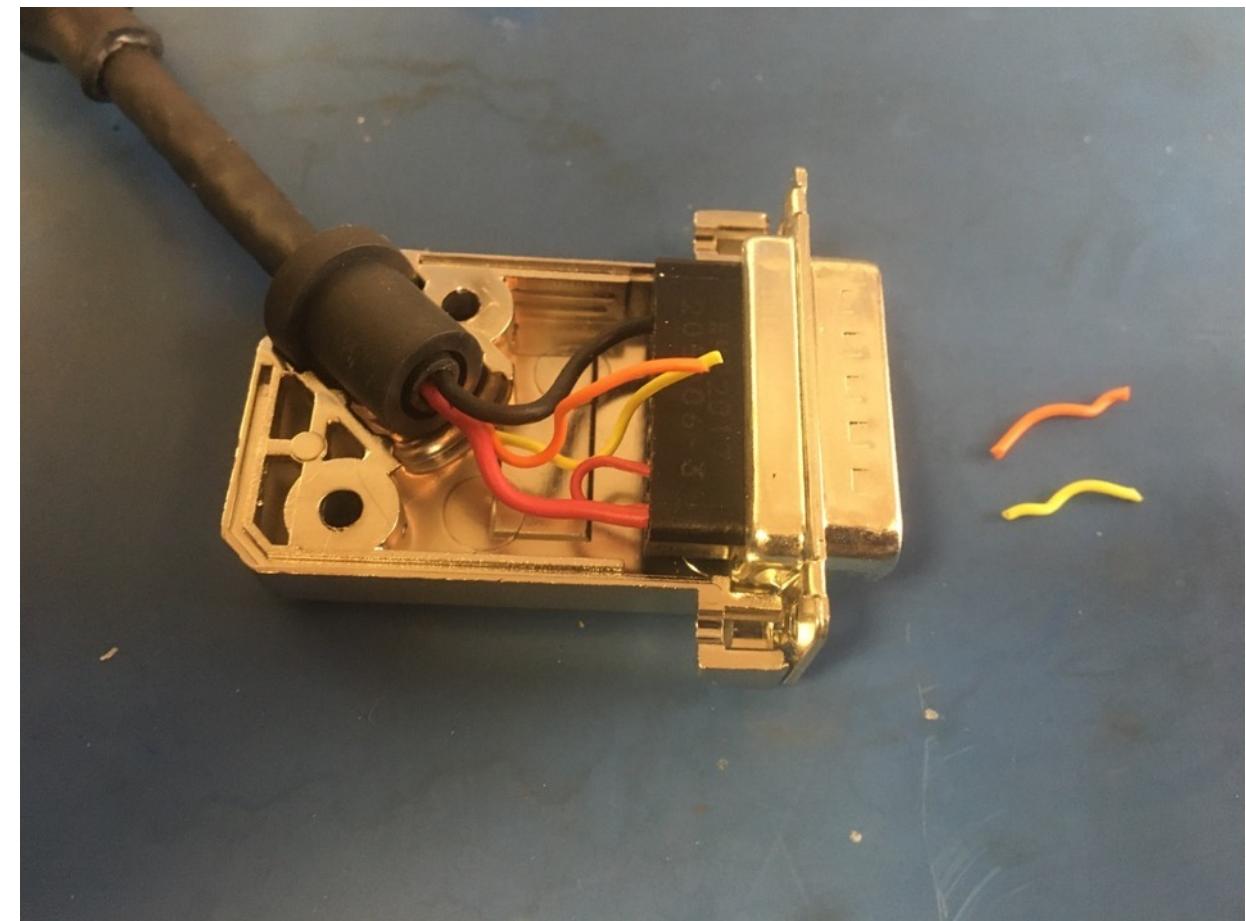
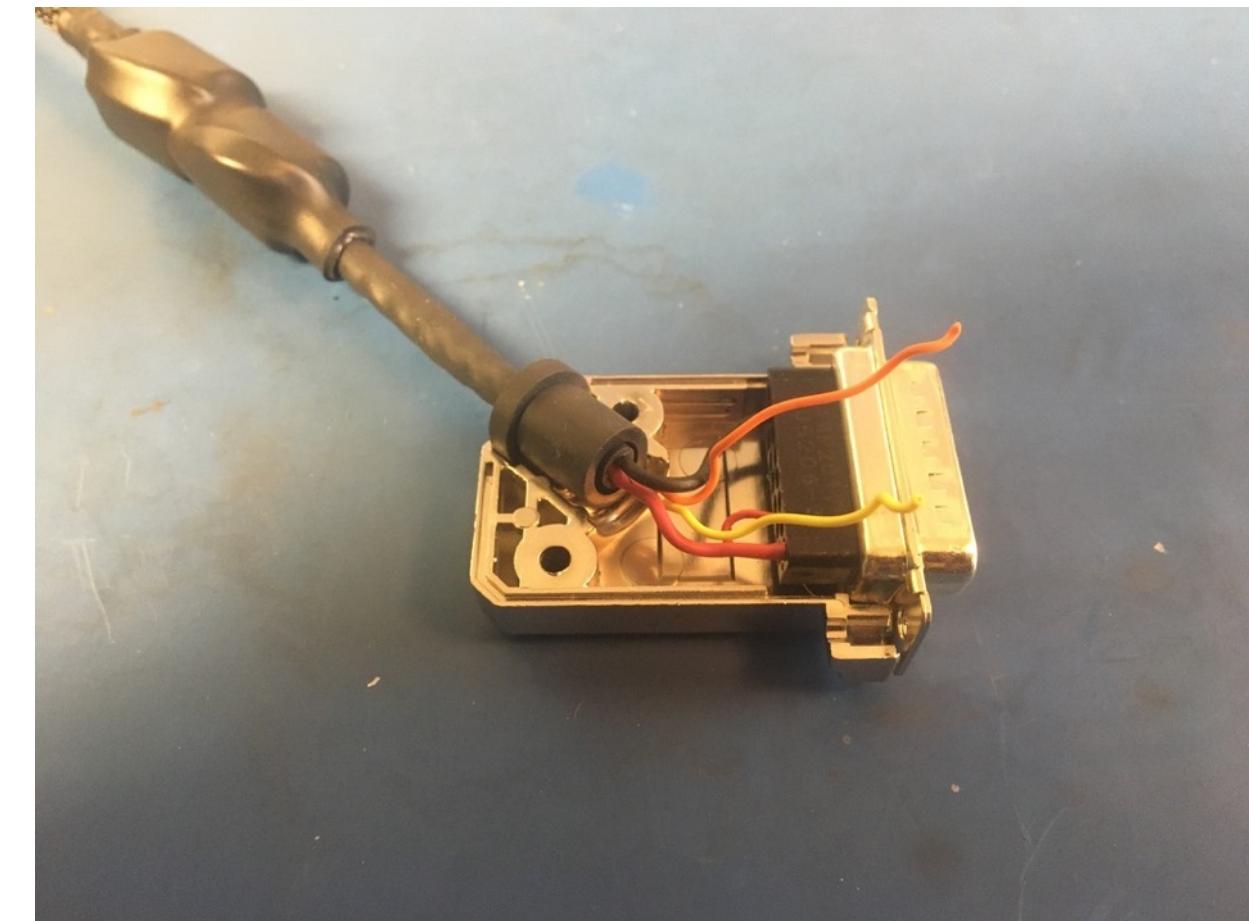
Strip the 20 awg red wire. Then crimp both red wires together using the a 20-24 awg D-sub pin. Crimp the other end of the 28 awg wire using a 24-28 awg sized pin and crimpler setting.

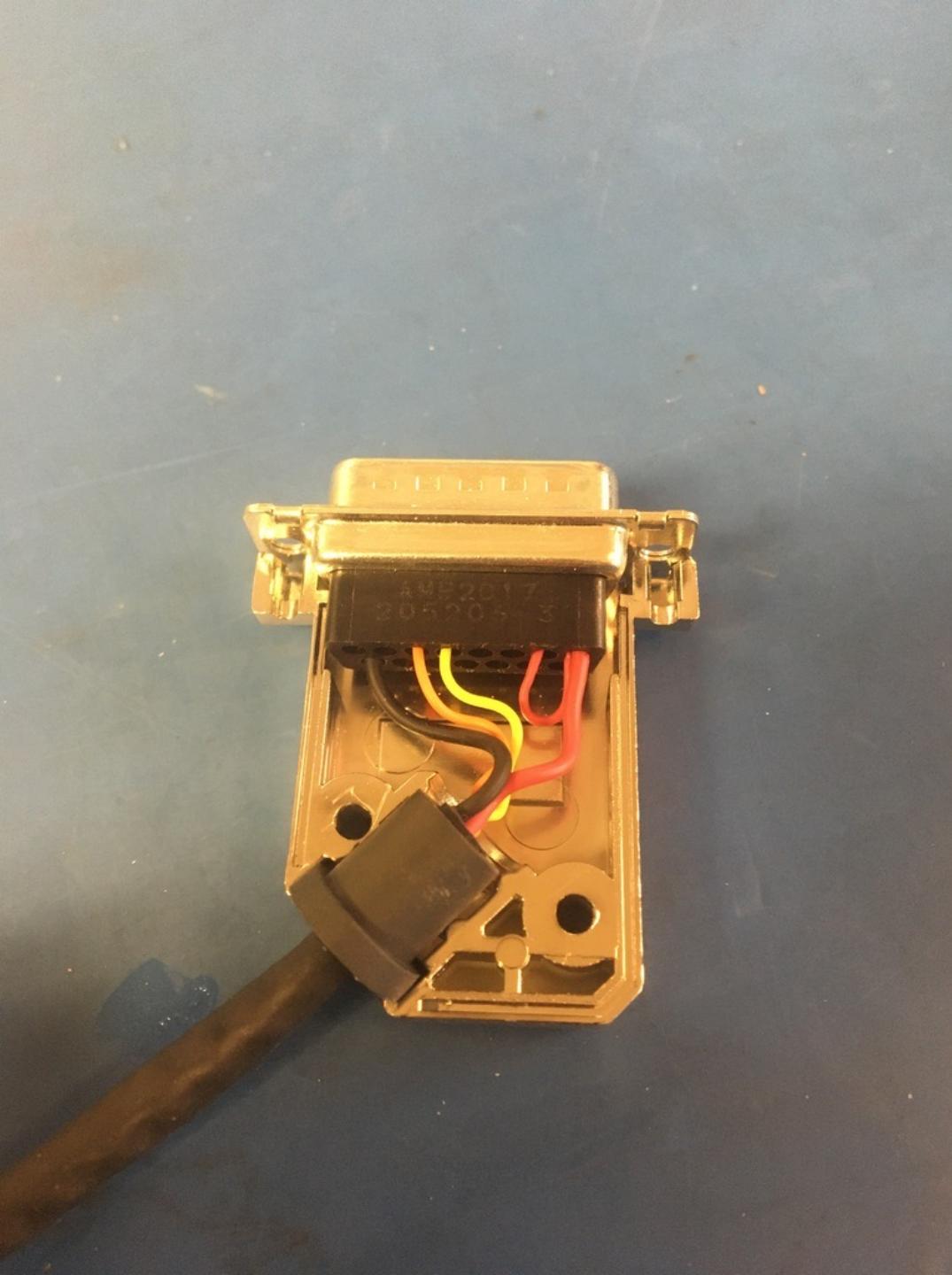


Place both red wires into their holes simultaneously (its more difficult to do them one by one). Insert the wires fully one at a time using the insertion tool.



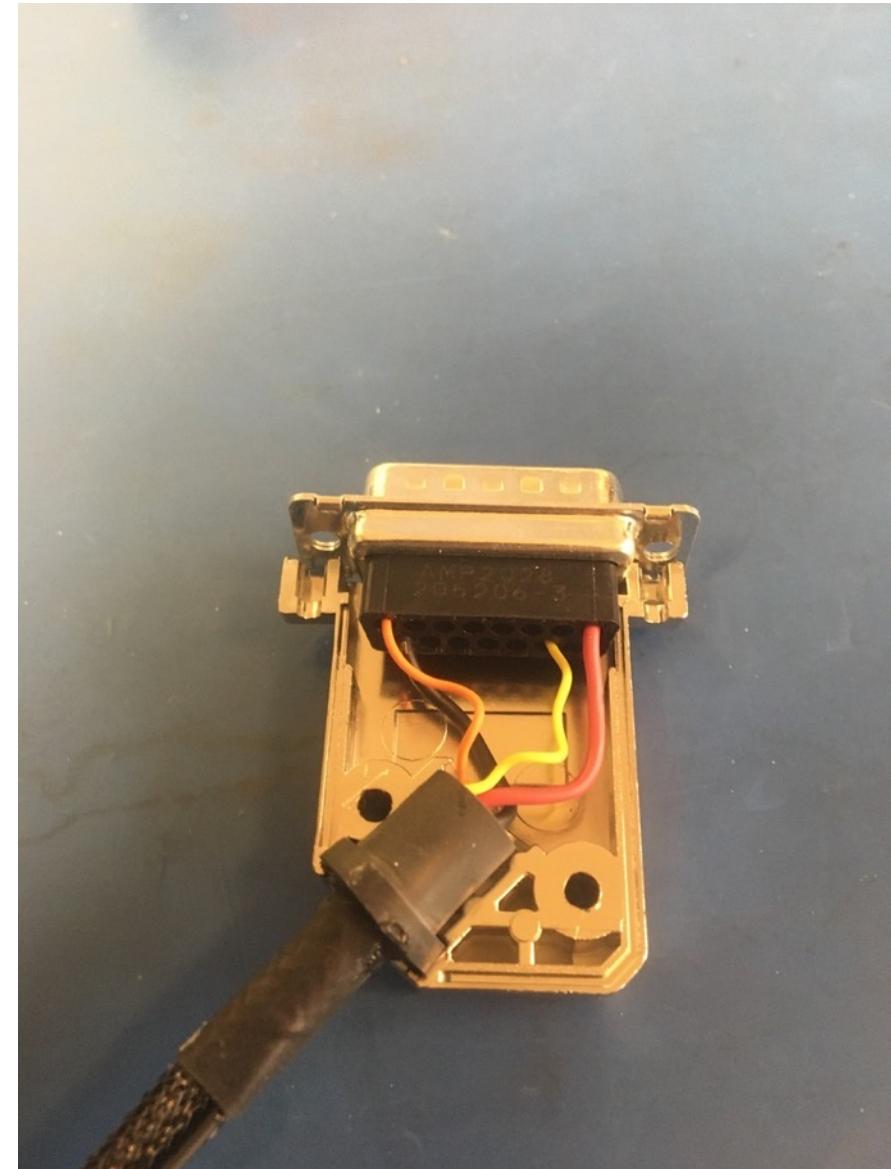
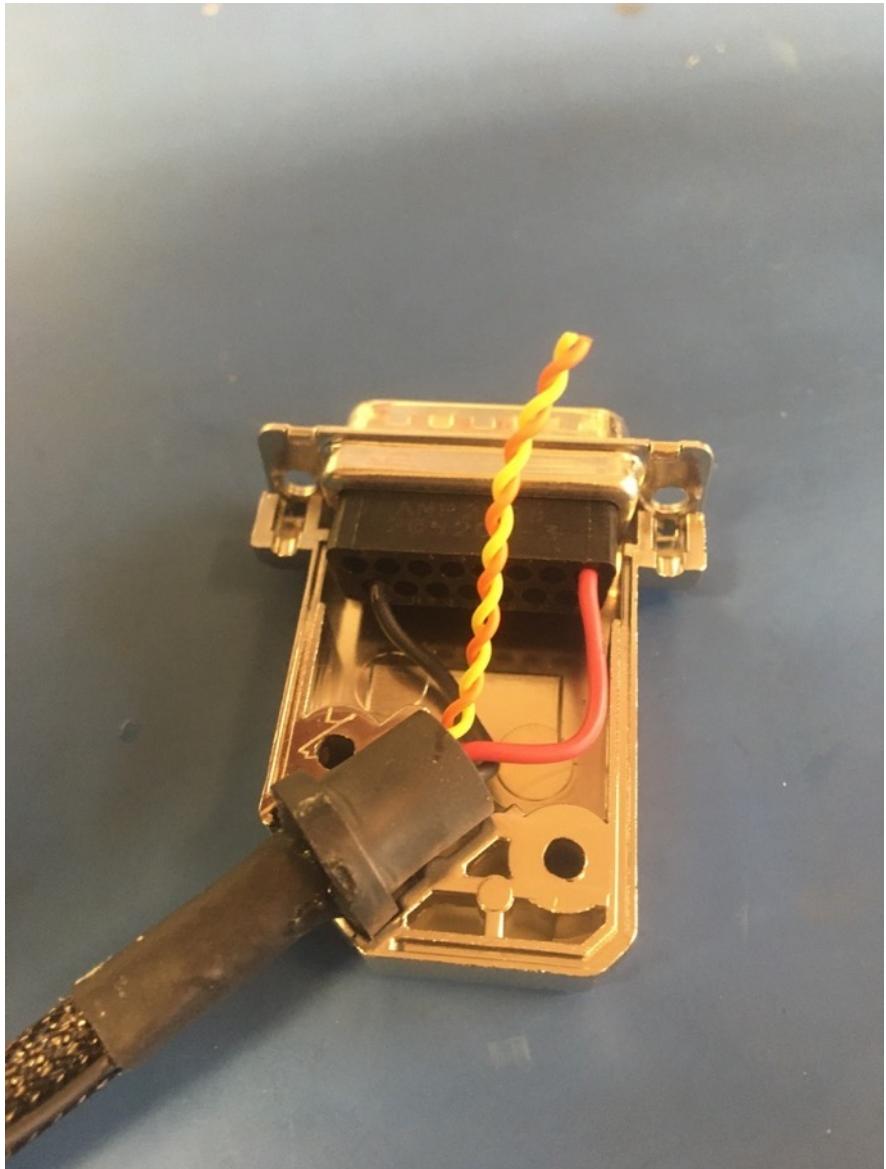
Untwist and straighten the orange and yellow twisted pair. Position them as shown in the photo on the right and trim them so they end midway through the black part of the connector.





Strip, crimp, and insert the orange and yellow wires as previously exampled by the black wire. Be sure to use 24-28 awg pins and crimper setting.

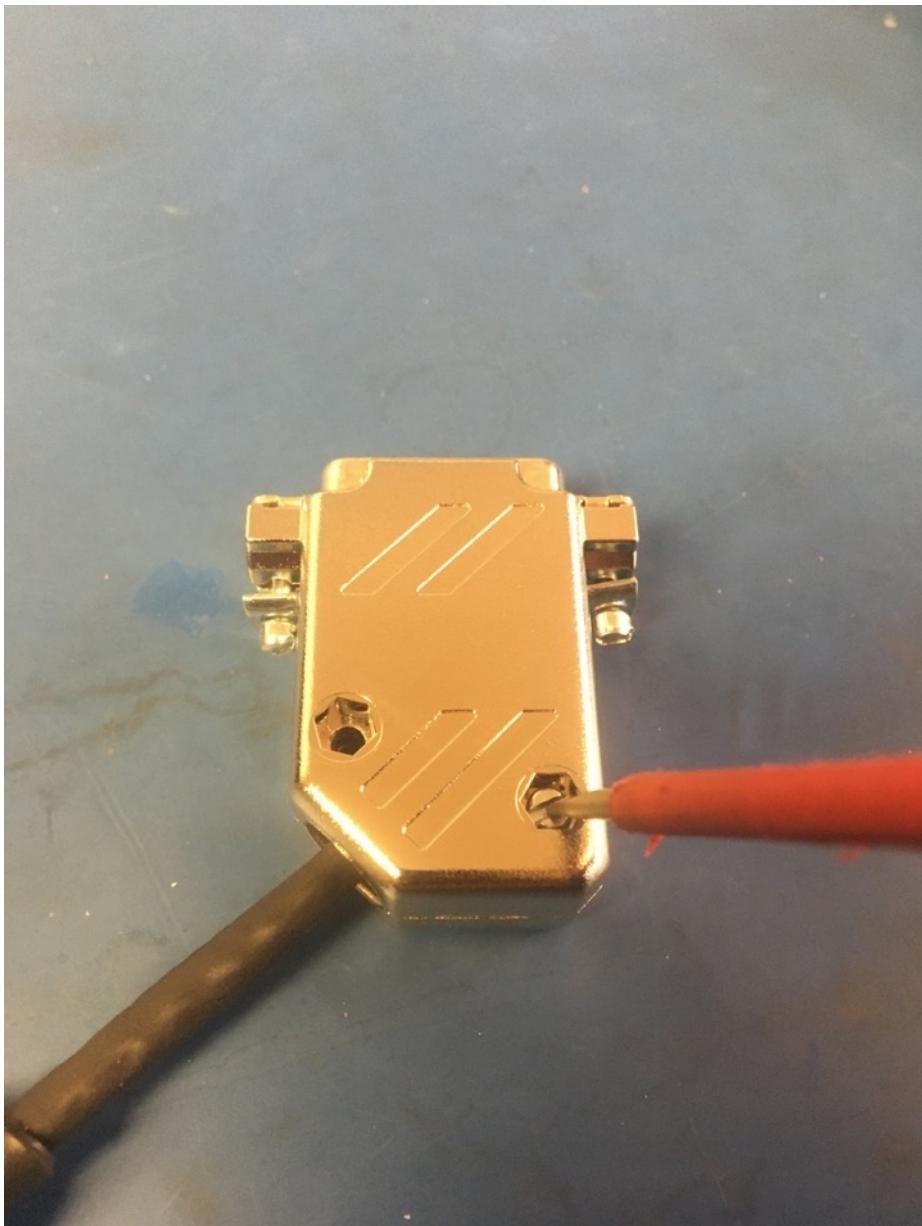
Now take the ground wire end of the harness and repeat the process of untwisting, measuring, trimming, stripping, crimping, and inserting the wires. Note that this end does not have a 28 awg red wire and that the orange and yellow wires are not in the same positions in the connector.





Place the tops of the D-sub shells onto the bottoms on each end. Put the connector screws and washers in as well.

Close each D-sub shell using the screws and nuts.





Wire harness complete! The ground wire will be given a tip later.