N.B. - The information below is my best shot as a guide. Following this guide is at your own risk. If you are not sure what you are doing get help.

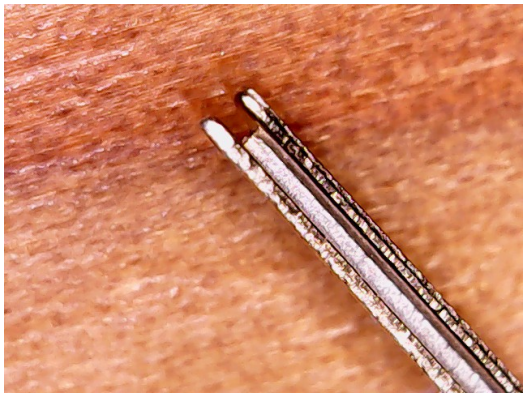
This article may be corrected or updated at any time. If you find a mistake or a significantly better way of doing the job please let me know.

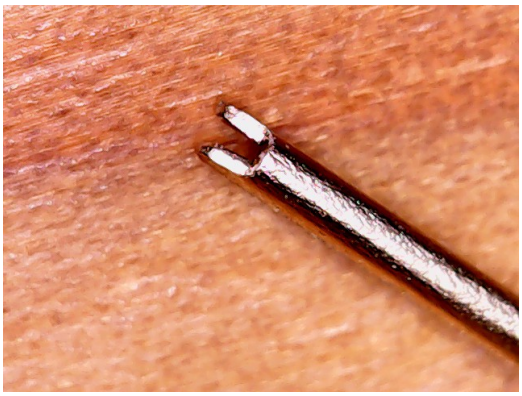
What is wrong with battery and servo connectors?

Compared with a few decades ago, complex electronic systems such as radio control are sometimes very cheap. This can makes the cost of wiring, switches and connectors expensive relative to the cost of semiconductors and circuit boards. Consequentially, manufacturers seeking to minimise costs often use very poor quality connectors.

On returning to model flying after some decades of paragliding I bought an ARTF model and noticed the connectors to the aileron servos, which had to be plugged and unplugged into a splitter cable at every flying session, seemed to get very slack very quickly. I decided to change them and rather than solder on ready made ends I decided to have a go at crimp connections. Although I have been soldering connectors for most of my life I have seldom used crimped connectors. I looked at some videos online, bought a crimp tool and connectors and had a go at fitting the connectors myself.

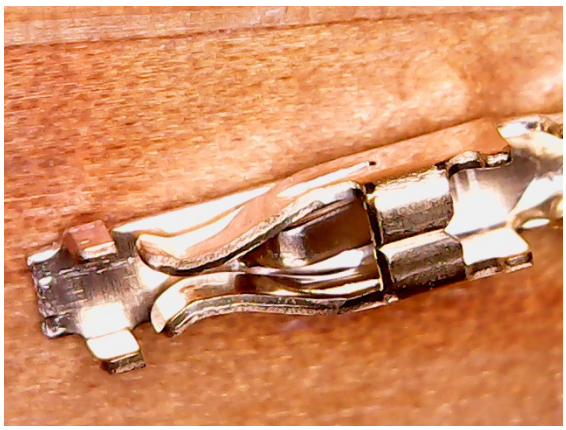
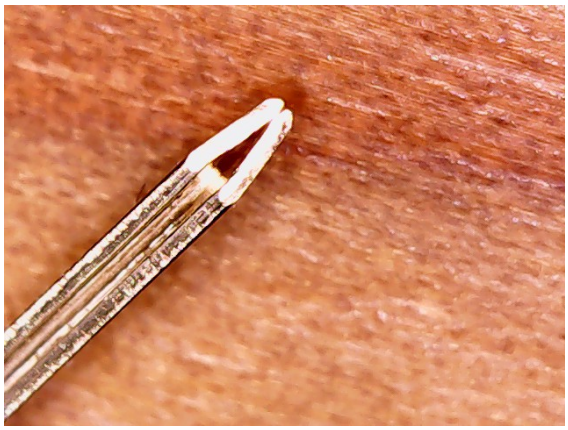
When I tried a few experiments, the crimping itself worked well. However, to my horror, the mating pins and sockets were as bad, possibly worse, than on the connectors I intended to replace. Inserting them felt like the ends were running over coarse sandpaper. On inspecting them with a lens I found they had very poor surfaces, especially the pin parts, which also had edges which scraped the contact surfaces as they were inserted:





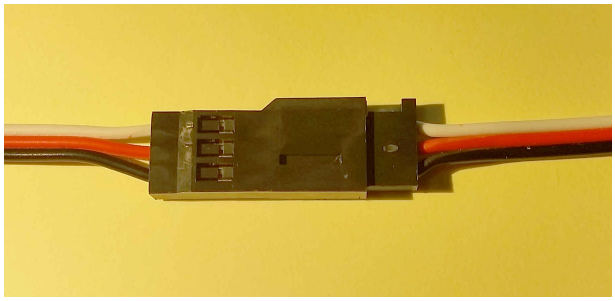
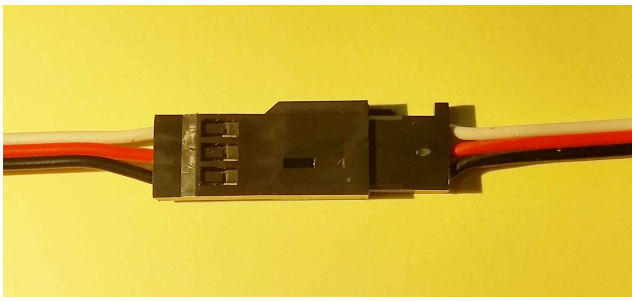
These connectors are derived from Dupont header connectors for printed circuit boards. The connection surfaces of the socket parts are designed to press on the top and bottom surfaces of the pin parts rather than the sides.

At this point I purchased some genuine Futaba connectors. They are several times the cost of other types, but still cheap compared with crashing models. These connectors have a significantly different design. The socket is designed to grip the sides of the pin as well as the upper and lower faces, and the mating surfaces are much smoother:

Furthermore the end of the pin is designed to part the side connection surfaces of the socket properly as it is inserted so there is less scraping:

The socket housing also has a slot through which you can see how far in the plug has been inserted. The connector in the left hand picture below is fully inserted but the right hand one only partially:

Until I find better connectors I will only use genuine Futaba ones. These are the part numbers (from Ripmax).

Socket (8 off) Y-MA2242

Plug and Socket (4+4 off) Y-MA2243
Plug (8 off) Y-MA2165

These connectors are generally compatible with JR style connectors although with some it may be necessary to cut off the polarisation flange from the housing and be careful to ensure the plug is inserted with the correct polarity.

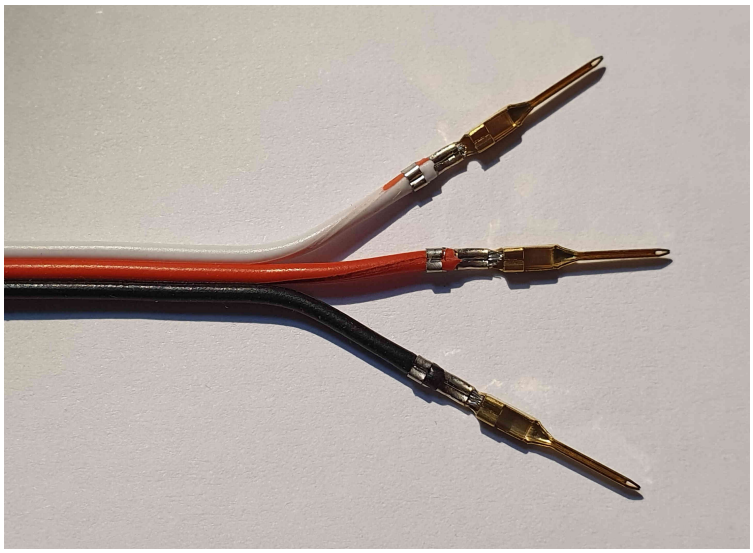
Crimping requires some care and it took some experiment to find the best method for the Futaba connectors.

Order and orientation of crimping

Firstly I apologise to left handed people who will have to figure some of this out for themselves!

For myself and other right handed people, to get the correct orientation of the pins for either male or female connectors the wires are first separated about 15mm back from the ends.

When you are making the crimps hold the cable in the orientation shown below and make the crimp on the white (signal) wire first, then black, then red.



The crimp tool I use is an Iwiss type IWS-2820M

I use the 1.6mm slot for crimping the conductor. I then crimp the insulation in the 1.9mm slot. The crimp is good doing this, but sometimes it is difficult to get the pins or sockets into the housings, so I then re-crimp the insulation in the 1.6mm slot. (If I crimp the insulation in the 1.6mm slot without first crimping it in the 1.9mm slot the flanges often bend sideways.)

These things are rather small and I use a fairly strong magnifier.

Step by step:

1) Strip back 3 to 4mm of insulation from the wire, being careful not to break any strands of the conductor. It is not necessary to twist the strands together to make the crimp but a twist may help the placement of the conductor in the crimping slot without losing some strands.

2) Carefully place the flanges of the conductor crimp into the 1.6mm slot of the crimp tool and gently close it enough to make sure the crimp will not fall out.

3) Place the wire into the crimp so the conductor is inside the flanges and the end of the insulation is just at the back of them.

4) Squeeze the crimp tool hard. The edges of the flanges should roll over and squeeze the wire.

5) Remove the crimp from the tool, and give the wire a good pull to make sure the conductor is properly held by the crimp.

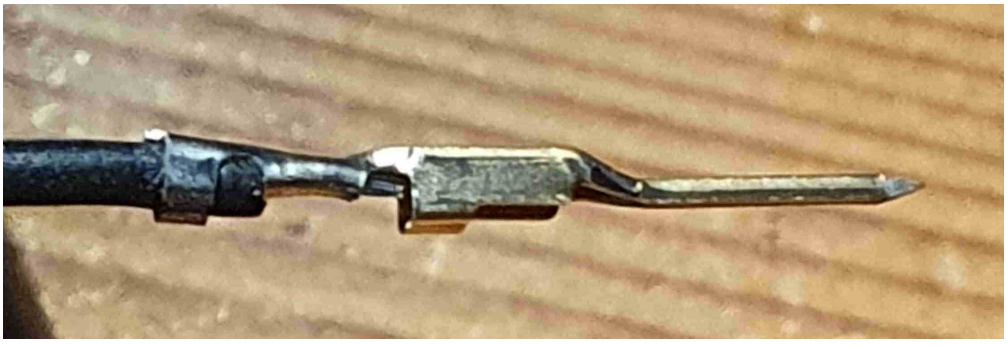
6) The flanges which will crimp the insulation will be open a bit too wide to fit the slot on the crimp tool. Using either small pliers or the end of the crimp tool squeeze them gently together until they are approximately parallel.

7) Put the insulation flanges of the crimp into the 1.9mm slot of the crimp tool and very gently squeeze it. The flanges should roll over and hold the insulation. It does not need to be very tight at all. Over-crimping with smaller wires will probably damage the conductor.

8) Take the crimp out of the 1.9mm slot, place it in the 1.6mm slot, and gently crimp again to ensure it will fit in the housing.

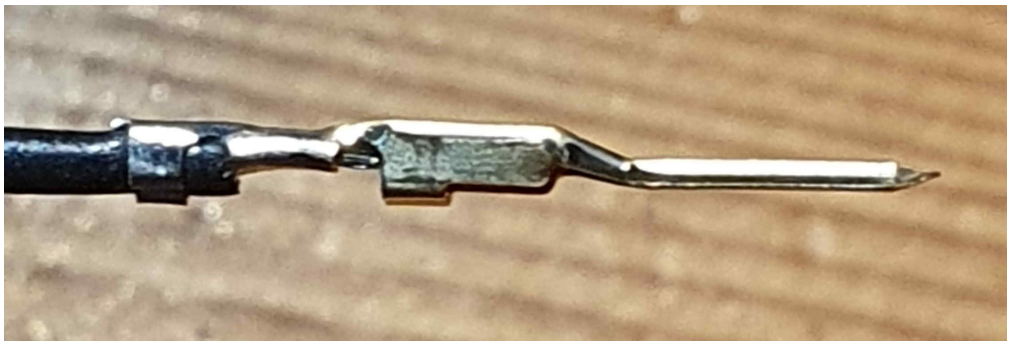
9) Using a sharp craft knife trim any “frilly” bits of insulation sticking out which may stop it fitting into the housing.

10) Look carefully at the crimped connector in the pictures below:



This picture is immediately after crimping. Note the connector is bent upwards slightly at the point where the conductor is crimped. This seems to be a side effect of the crimping process itself. If we insert the connector into the housing in this condition it may jam and the pin may not be central.

The connector may be gently straightened with a pair of small pliers as this picture.



11) Slide the crimps into the back of the housing until the plastic latches click. If they stick a bit I push them on the end of the insulation crimp with a watchmakers screwdriver.

Wire Sizes

Servo wires are usually made from a number of strands of tinned copper wire of about 0.08mm diameter. However they normally sized by their equivalent in a single strand of wire in AWG (American Wire Gauge).

So far I have made good crimps of 22 to 28 AWG wires on the Futaba plugs. I have to be very careful with 28 AWG and 30 AWG proved too small. 30 AWG may work on a different type of connector.

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