

## Repairing a transmitter aerial

These notes are about repairing a FrSky Taranis X9D, but the general principles should apply to many makes and models of transmitter. I have no connection financially or otherwise with the makes and suppliers listed.

If, when you switch on, you get the message 'WARNING Tx antenna problem' then you probably have a faulty aerial (antenna). Even if the model appears to respond do not fly until it is fixed. Your range will be lower and you won't know by how much. On the X9D a good way to check is on page seven of radio setup. You see a number at the bottom labelled RAS (Relative Antenna Status). This is a measure of how efficiently the aerial is working and should be zero or close to it. Much higher than one and the aerial is probably defective. You can also use it to check whether the repair has worked or whether part of the electronics has also failed.

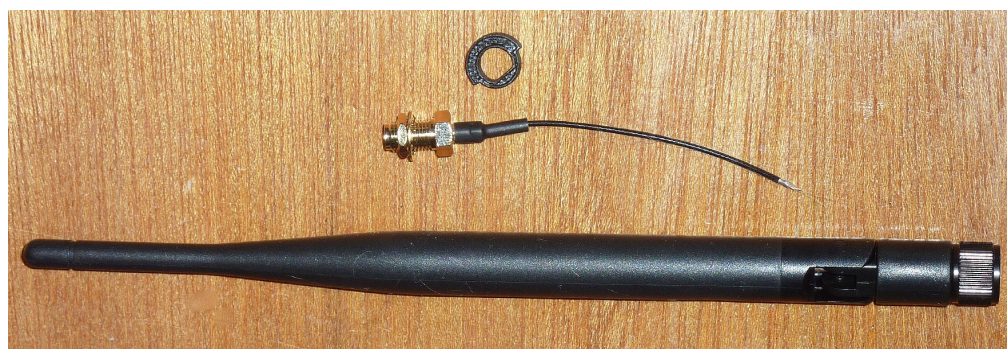
The standard folding X9D transmitter aerial is fairly fragile. Unless you have the version of the board with the plug in IPEX connector on the board, replacement requires some delicate soldering. Don't attempt it unless you have a steady hand and a good quality iron with a very fine tip, ideally one with temperature control. Otherwise sweet talk the club electronics expert. He or she will usually respond to flattery.

If you are replacing the aerial with another standard one you can skip the next bit and move straight to 'Soldering in the new feed wire.'

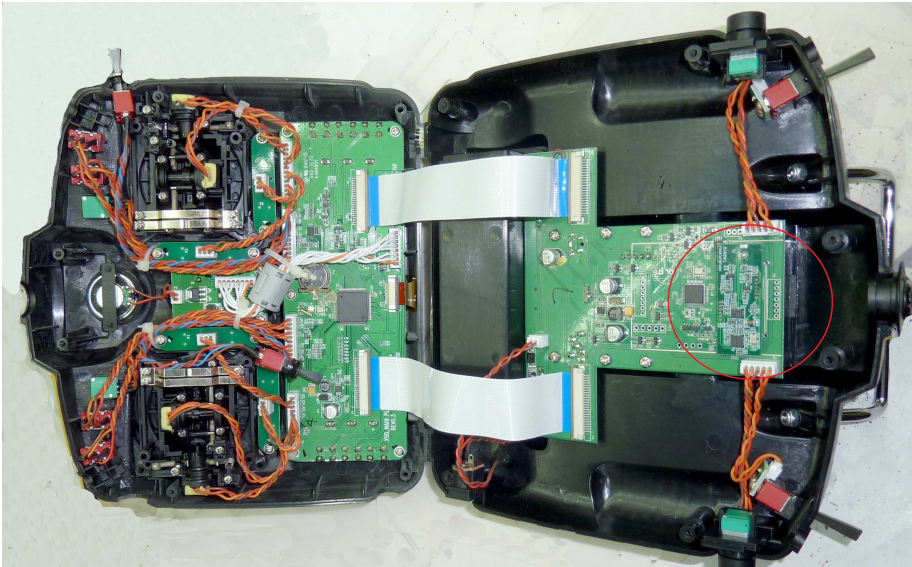
I decided to replace the standard aerial with a removable one that screws on. For this I had to install a different fitting called an RP-SMA connector. SMA is an abbreviation for SubMiniature version A and RP is Reverse Polarity meaning a pin rather than a socket. I bought a kit from banggood for about £7. Its address is at the end. If I had only wanted the aerial I would have gone to the excellent UK company T9Hobbysport, which is also listed at the end.

The aerial is detachable, though the connectors only have a life expectancy of five hundred times screwing on and off. You can also use the RAS to check if the RP-SMA needs to be replaced after it has been used a lot. There is a small loss of signal compared with a direct soldered aerial connection as even high quality gold plated connectors will drop a signal by 1 dB or so. However I bought a 5 dB aerial rather than the standard 2 dB so this should compensate. The extra 3 dB in theory doubles the radiated power. The aerial is longer so I will have to remove it for storing in the box. The higher gain aerial is more directional so don't point it at the model when flying.

The RP-SMA fitting and 5 dB aerial kit



After removing the six crosspoint screws the case falls open. Oh, where did that screw bounce off to? The part we are going to deal with is in the red circle. Take a photo so you refit switches the right way round.



I had to trim the plastic bush in the top of the Tx to allow the threaded part of the RP-SMA fitting to stick out far enough. With a fine hacksaw and a craft knife I removed one layer of the top and was left with this.

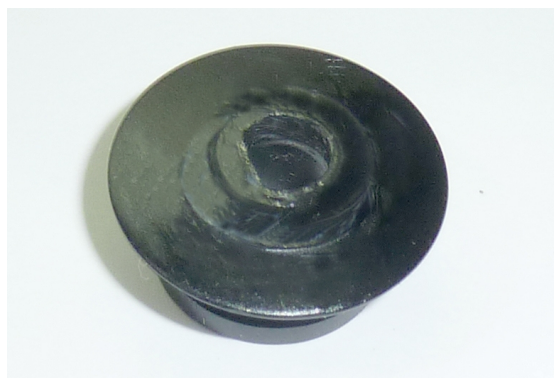


I then glued the plastic washer that came with the new aerial into the bush using epoxy. Notice there is a flat that locks the connector so it can't rotate. You might need to open out the central hole in the rear of bush so the hexagonal part of the RP-SMA connector fits in. I used a 10 mm drill bit, hand held and not in a chuck and then made grooves for the points on the hexagonal body with a burr in a Dremel.

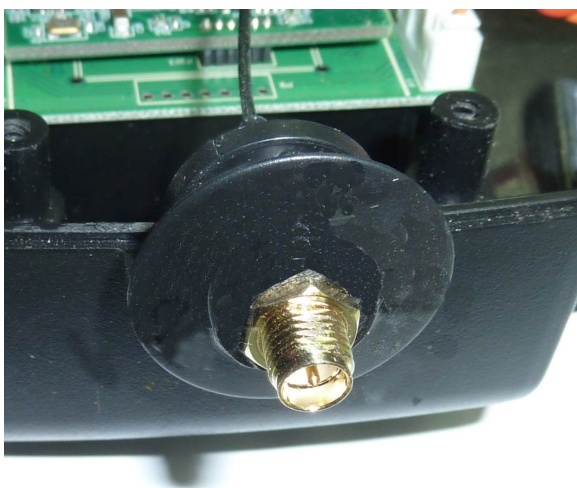
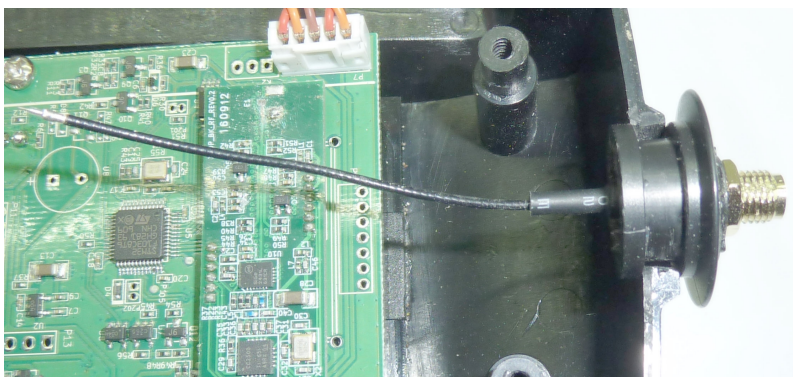
Washer



Washer glued in place in bush



These pictures show the bush fitted into the Tx before soldering the feed wire. Fixing the bush first reduces the strain on the newly soldered joints later. I also used to masking tape to secure it further, only removed after screwing the case back together.



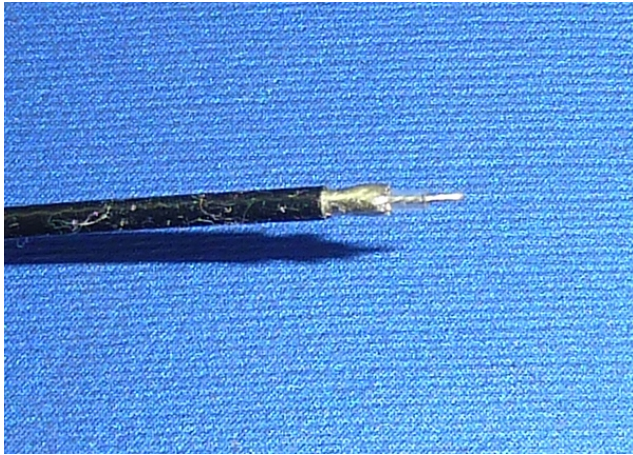
### **Soldering in the new feed wire**

If you have jumped straight here take a look back at the picture of the Tx opened up and the red circle. Unscrew the six screws and open the case. Take a photo of the opened up Tx especially the solder connections especially if your Taranis is a slightly different model from that in the pictures. It also helps with getting the switches back in the right way round.

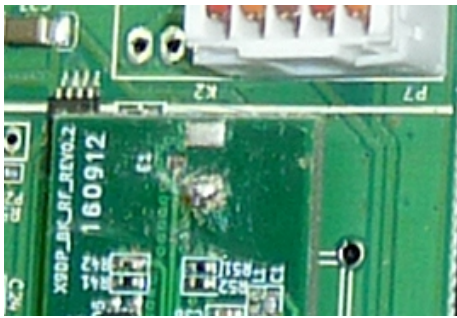
Below is a picture of the new feed wire from the RP-SMA connector as supplied - no need to trim it. There will be a similar one if you are replacing an aerial without using the RP-SMA. You can see the bare end of the wire on the right, then the plastic insulation, then the outer braid and finally the outer black sheath. The bare end must be soldered onto the left hand pad and the braid to the lower one. You don't need lots of solder but make sure it is shiny and rounded when hardened. A grey or cloudy surface means a poor, 'dry' joint, which must be done again.

The braid is the tricky bit. Heat the braid in advance and put a blob of solder on it. You then just have to touch this with the iron onto the blob on the board.





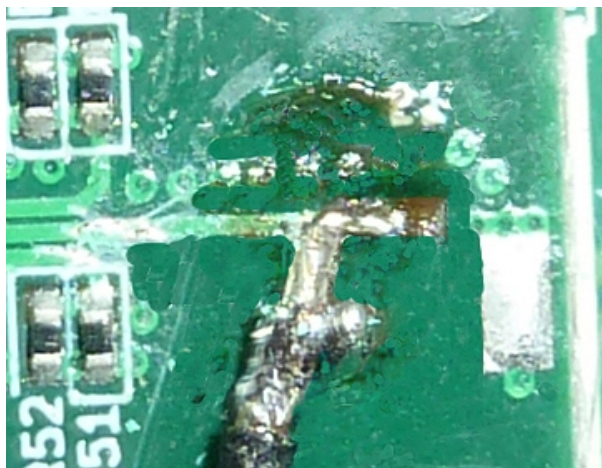
Using the soldering iron, remove the old feed wire from the board. If there is a lot of solder clean up the solder pads using a solder suction tool or braid, taking care not to overheat the board. Leave a blob on the lower pad. The two pads will look something like this. The lower blobby one is what the braid solders to. The small dark pad up and to the left is where the core wire goes. In my case that pad had pulled off so I had to scrape the green varnish off the track leading to the pad with a scalpel and solder to that.



I found a bench magnifier useful.

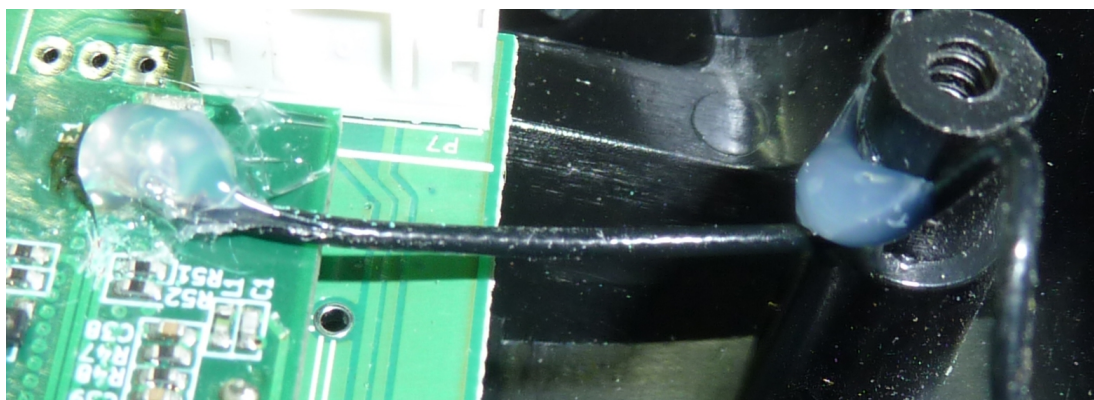


Here is my first attempt - the most tricky soldering I have done for years.



First I scraped the track again with the scalpel and a bit further along bared some more track to allow a continuity check with a meter. I bent the bare wire end round to match the track. Then I soldered the braid and finally soldered the bare wire. I couldn't find my macro lens so the picture is a bit blurred and I have tidied it up a bit with Photoshop for clarity. The continuity and short circuit checks gave good results.

Finally, I locked the wire onto the board by putting on a blob of hot melt glue using a glue gun. The glue does not affect the electrical properties. Do not forget this step. It is crucial to ensure that the wire is firmly fixed in place so I also glued it to a pillar as you see in the photo.



Oscar Liang suggests using hot glue to fix the feed wire down onto the case of the transmitter, which is only possible if the feed wire is fairly long. Mine wasn't. He also suggests locking the RP-SMA connector into the plastic bush as well. I didn't need to do that as there was a tab and a notch to lock it. His website, listed at the end, is an excellent source of information.

You will know if the repair has been successful when you switch on. If it isn't, you will get the error message again.

### **Dummy load in place of an aerial**

The Tx that needed repair was one that I use as the slave on a training buddy connection. It was disconcerting for the trainee to have to keep clearing an error message so it had to be mended. I don't need the aerial on it for buddying, especially the new longer 5 dB one.

A feed wire can safely be disconnected from an aerial provided there is a load connected to it to soak up the power and stop it being reflected back to the transmitter. So I decided to fit a dummy load, in this case called something like a '50 ohm RP-SMA dummy termination load'. The power produced by the Tx is low at less than 100 mW so any dummy should do. And of course I can now more conveniently use it for a flight simulator.

The replacement aerial and RP-SMA connector are unusual in that the aerial is female, having a metal socket, and the RP-SMA is male having a metal pin. Usually it is the other way round. Remember RP means reverse polarity. When ordering a dummy load make sure you get one to match the RP-SMA connector. In my case this was a female one as shown in the picture.



Here it is fitted.



### Or change to IPEX

There is another way to do this repair. You can buy IPEX connectors that you solder to the board. They are also called Hirose U.FL and Amphenol AMMC. I haven't tried one. They are tiny and difficult to work with. You would then need to fit a different RP-SMA connector having a feed wire fitted with a mating IPEX connector. I think some Taranis Tx's were supplied with the aerials connected to the board with one of these at one time. Some receivers use them for their aerial wires.



Connector to be soldered on the board or connected in some way.



Connector on the feed wire

### **And finally a dummy resistor**

I realised after doing all that work that if I was only ever going to use the Tx as a buddy slave it didn't need an aerial or a dummy load. I could have got away with just soldering a 50 ohm resistor across the two pads. Oh well, another working Tx might be useful one day, maybe when I drop my present main transmitter.

### **Sources and links**

[banggood.com](http://banggood.com)  
[t9hobbysport.com](http://t9hobbysport.com)  
[OscarLiang.com](http://OscarLiang.com)

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