Converting the ER9X to support FRSky Telemetry

A simple guide for the rest of us!

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About this guide

This guide has been put together to help those who wish to modify their stock er9x radio to support the FRSky telemetry protocol. This job is not overly complex, however be warned, if you are not good with a soldering iron, there is a very real chance you could screw up your radio!

By far the most important thing about this guide is that it is being written by an end user. I am not an expert in electronics. The point is you do not need to be to make this mod! You simply need to be patient, and careful!

Shopping List

The following list highlights the key items you will require, prior to starting your conversion. You do not need to purchase these from the suppliers listed. The links are simply provided to give you a start in the right direction.

- **Er9x radio**
  http://www.hobbyking.com/hobbyking/store/__8992__Turnigy_9X_9Ch_Transmitter_w_Module_8ch_Receiver_Mode_2_v2_Firmware_.html

- **Sparkfun RS232 TTL Convertor**
  http://www.sparkfun.com/products/8780

- **Smartie Parts Add On Board**
  http://www.smartieparts.com/shop/index.php?main_page=product_info&cPath=3&products_id=331

- **2 x 220ohm resistor**
  http://shop.ebay.co.uk/i.html?_from=R40&_trksid=p5197.m570.l1313&_nkw=220ohm+resistor&_sacat=See-All-Categories

- **1 x 2.7K resistor**
  http://shop.ebay.co.uk/i.html?_from=R40&_trksid=p5197.m570.l1313&_nkw=2K7+resistor&_sacat=See-All-Categories

- **1 x 470ohm resistor**
  http://shop.ebay.co.uk/i.html?_nkw=470+ohm+resistor&_sacat=0&_odkw=2K7+resistor&_osacat=0&_trksid=p3286.c0.m270.l1313

- **Some Single Core insulated cable (IDE Ribbon Cable works well)**
  http://shop.ebay.co.uk/i.html?_nkw=ide+ribbon+cable&_sacat=0&_dmpt=UK_Computing_CablesConnectors_RL&_odkw=ide+cable&_osacat=0&_trksid=p3286.c0.m270.l1313

- **1 x DHT DIY Module or DJT Module**
  http://www.hobbyking.com/hobbyking/store/%5F%5F17205%5F%5FFrSky%5FDHT%5F8ch%5FDIY%5FTelemetry%5FCompatible%5FTransmitter%5FModule.html

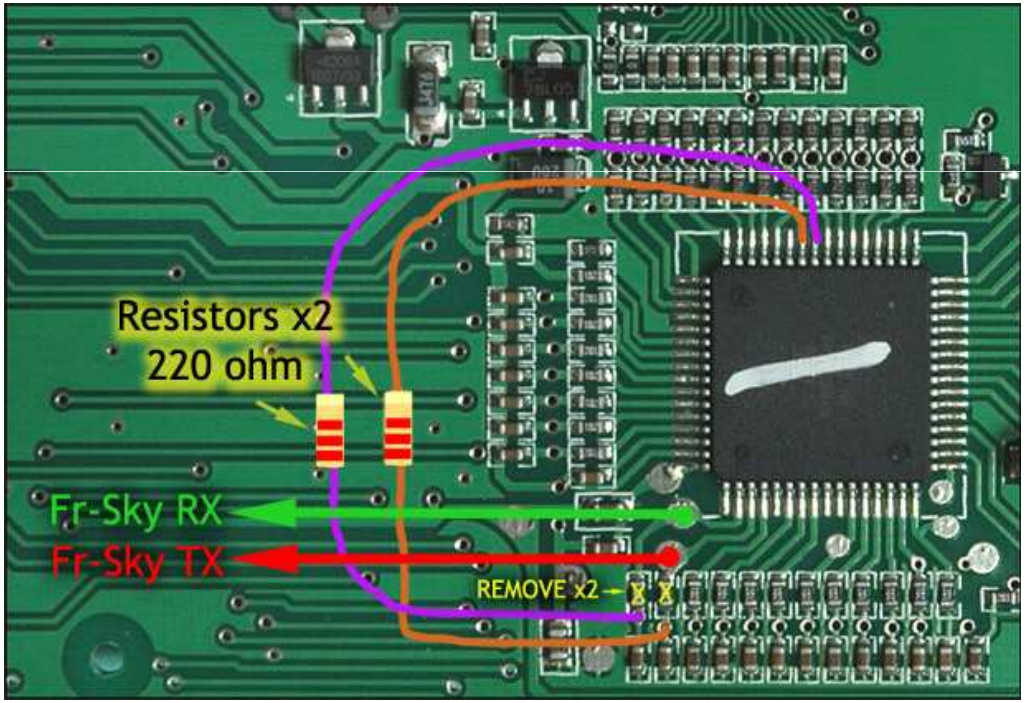
Step 1

Step 1
This is by far the hardest part of the job, and extreme care should be taken to avoid damaging your tx permanently!

Referring to the image:

- Remove the two left-hand-most resistors as indicated in yellow.
- Hot glue a couple of 220ohm resistors to a nearby area of the PCB

- Solder your 'super fine' wires to pins 41 and 42 of the ATmega and connect to the top end of the resistors as shown.



HINT: *Pre-solder the wire end and the ATmega pins.*
Use a solder sucker or de-soldering wick to clear away excess solder from the two pins and to remove any solder bridge. Then lay the first wire end over the pin and apply the soldering iron directly down on top of it for half a second, then directly straight up -- then let go the wire. Give the wire a gentle tug in the direction directly away from the chip (in line with the pin).If it holds -- you're done. Don't futz with it. If you're right handed, solder the left hand wire first, so the the soldering iron does not lay over the first wire when trying to solder the second.

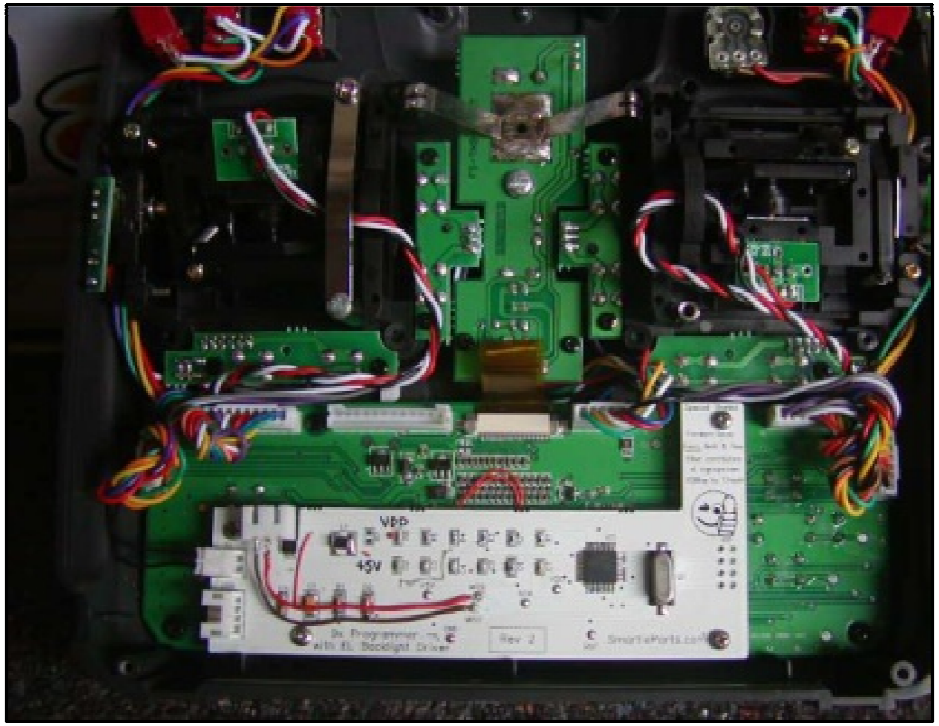
Note! It pays to either tape or hot glue the wire in place. The last thing you want to do is to snap the wire and rip the pin off the cpu!

Step 2

Install the smartieparts board. This job is so simple that there is no need to duplicate information in this document. Infact, chances are you have already at this point installed one before contemplating this mod!

- For reference, a comprehensive guide for this install can be found on: http://er9x.googlecode.com/svn/trunk/doc/9x-addon-instructions.pdf

- The end result will look similar to the image below:



Note! At this point it is worth taking a look at the board and making note of the labels that have been printed on it.

Namely MISO, MOSO, 5V and GND.

These will all be used when plugging in the RS232 Convertor!

Step 3

This step uses the Sparkfun RS232 convertor, and could not be simpler!

You will needs to get yourself one of these:

http://www.sparkfun.com/products/8780

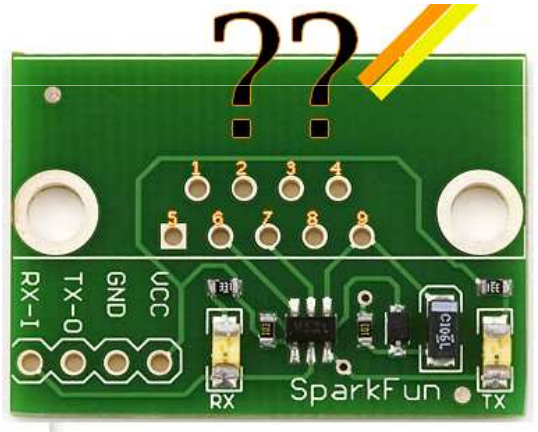
And then take note of the following connections that you will need to solder up. Each of these runs from the Sparkfun Adapter to the labelled pad on the Smartie Parts board.

RX-I -> MISO
TX-O -> *[470ohm resistor]* -> MOSI *(a resistor is soldered inline)*
VCC -> 5V
GND -> GND

In addition you will need to wire these two pin from the sparkfun adaptor to the DHT/frsky module.

The DB9 connections are:

(RS-OUT) -> *[2.7K resistor]* -> Frsky Rxd *(a resistor is soldered inline)*
(RS-IN) -> Frsky Txd



Note!
RS-OUT is marked as pin 6 on the image to the right.
RS-IN is marked as pin 7 on the image to the right.

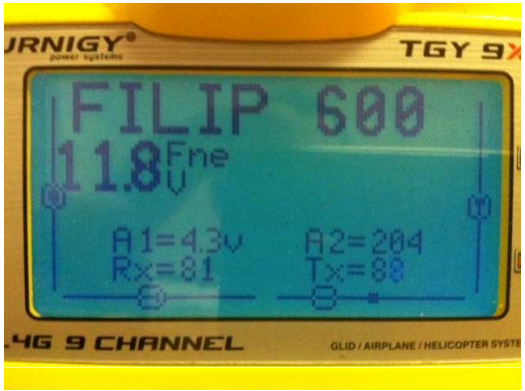
Note!
The resistors shown in the notes above are not mandatory, however are recommended as they limit the risk of the frsky module/cpu getting fried when loading the firmware with the transmitter powered on! I have personally wired this without the resistors and simply made sure I never flash the unit with my power switch on!

Step 4

Assuming you have successfully completed steps 1 to 3 you are done! Simply screw everything back together, and reflash your er9x with the frsky version of the firmware.

If everything has been done correctly you should now have er9x-frsky working!

You can get to the telemetry display by holding down the ‘down arrow’ on the tx. The image below shows what you should expect to see on your telemetry screen.



A1 = Analogue 1
A2 = Analogue 2
Rx = Receive Signal Strength
Tx = Transmit Signal Strength

Conclusion

I hope this guide has been informative and helped to explain the mod's in a non complex way.

I strongly encourage you to get involved with the community!

There is a very active thread on
http://www.rcgroups.com/forums/showthread.php?t=1266162

where you can get direct contact and help from the er9x developers. The team are always open to suggestions and very willing to help!

Should you have any questions regarding the conversion that are not covered in this guide, please get in touch with me on the rcgroups.com website. Simply PM: rob.thomson and you will find me!