

# Adding External Modules to Your Deviation Transmitter

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## Introduction

The Deviation firmware implements several protocols that the Devo series radios do not have the necessary hardware to support. To enable these protocols, it is necessary to install additional 2.4GHz transceiver modules.

The following modules are supported:

**Be very careful when purchasing modules from aliexpress or ebay. The vendors love to use search-optimized titles which will often list multiple chip names in the title despite only supporting one of the listed chips.**

### **A7105 Module**

The A7105 module is necessary to support the Flysky protocol (also used by WLToys V911, V9x9, and Xeida 9938) and the Hubsan X4 protocol.

It is possible to scavenge this module from a WLToys transmitter, or to purchase it standalone.

The XL7105-D03 is an A7105 transceiver with an integrated power-amp providing 17dBm of output power. It can be obtained from ebay or Aliexpress. Typical search term: 'A7105-500m'

<http://www.aliexpress.com/item/A7105-500m-wireless-transceiver-modules-NRF24L01-CC2500-SI4432-CC2530-module/623601913.html>

<http://www.ebay.com/itm/A7105-500m-wireless-transceiver-Antenna-nRF24L01-CC2500-SI4432-CC2530-/300777696218?>

[pt=US\\_Wire\\_Harnesses&hash=item4607bf6bda](http://www.ebay.com/itm/A7105-500m-wireless-transceiver-Antenna-nRF24L01-CC2500-SI4432-CC2530-/300777696218?pt=US_Wire_Harnesses&hash=item4607bf6bda)

I have run a range test comparing the XL7105-D03 and V911-Tx modules. In both cases I set the Tx on the ground, the antenna was inside the Tx and was bound to the V911. I then walked until the light on the V911 would flash intermittently. The path was line-of-sight, but along the edge of the woods, so not exactly a wide open field.

Using the V911 Module: range = 600ft

Using the aliexpress module: range = 650ft

The XL7105-D03 is rated at 500M, but at least with my setup, I didn't see any where near that distance.

### **CC2500 Module**

The CC2500 module is necessary to support the Skyartec and Frsky protocols.

It is possible to scavenge this module from a Skyartec transmitter or to purchase it standalone.

When searching ebay or aliexpress, searching for 'CC2500 PA' will often return reasonable results

<http://www.aliexpress.com/item/CC2500-PA-LNA-wireless-module-far-distance-2-4G/359941652.html>

<http://www.ebay.com/itm/CC2500-PA-LNA-SI4432-NRF24L01P-A7105-wireless-communication-modules-2-4G-1500m-/121064278513?>

[pt=US\\_Radio\\_Comm\\_Antennas&hash=item1c2ffe49f1](http://www.ebay.com/itm/CC2500-PA-LNA-SI4432-NRF24L01P-A7105-wireless-communication-modules-2-4G-1500m-/121064278513?pt=US_Radio_Comm_Antennas&hash=item1c2ffe49f1)

**NOTE: Read through this entire manual before starting work. Make sure you understand what is needed and how to do it. If you salvage the module from a V911 transmitter, you will destroy a V911 transmitter. Also, this procedure will void the warranty of your Devo8 in the process of implementing this modification.**

## **Necessary tools**

- A7105 or CC2500 module
- Small Phillips-head screwdriver
- Solder-sucker or solder wick (strongly recommended)
- hack-saw (optional)
- wire-cutters
- fine-gauge wire (30AWG 'wire-wrap' wire recommended)
- wire-wrap tool (optional)
- fine-tip (<30W) soldering-iron (NOT a soldering gun)
- electronics solder
- soldering flux (recommended)

## **Removing an A7105 module from a WLToys transmitter**

Note: There are a few WLToys transmitters that do not contain an A7105 module and cannot be used for these procedure. An example is the V202 transmitter. Note that these transmitters may be labeled as V929/V939 even though they are not actually compatible with those models.

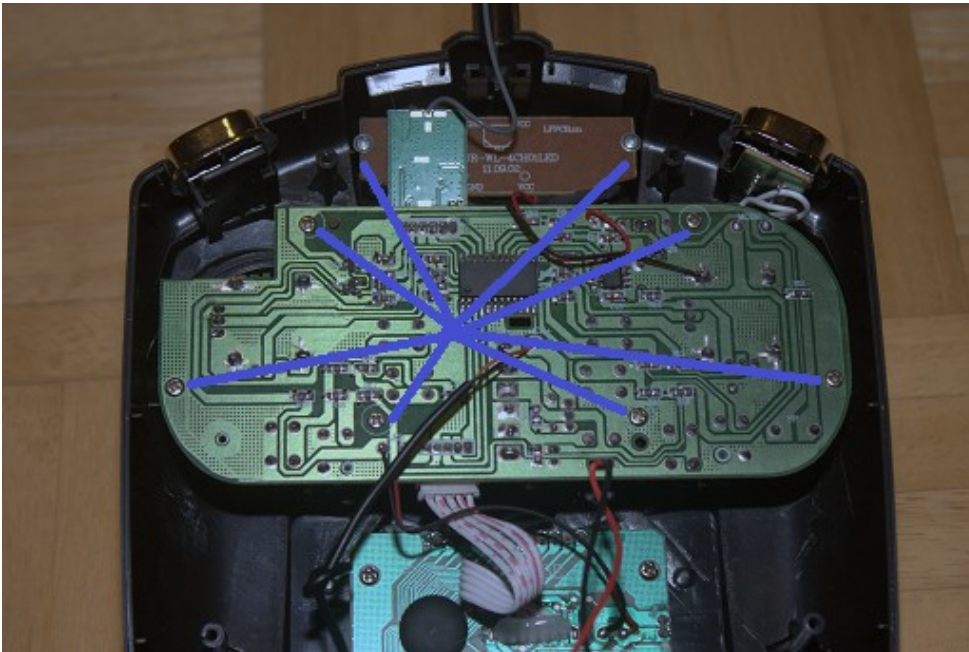
### ***Step1: Disassemble V911 Transmitter***

The 1<sup>st</sup> step is to disassemble the V911 transmitter. Start by removing 5 screws from the back of the transmitter as shown



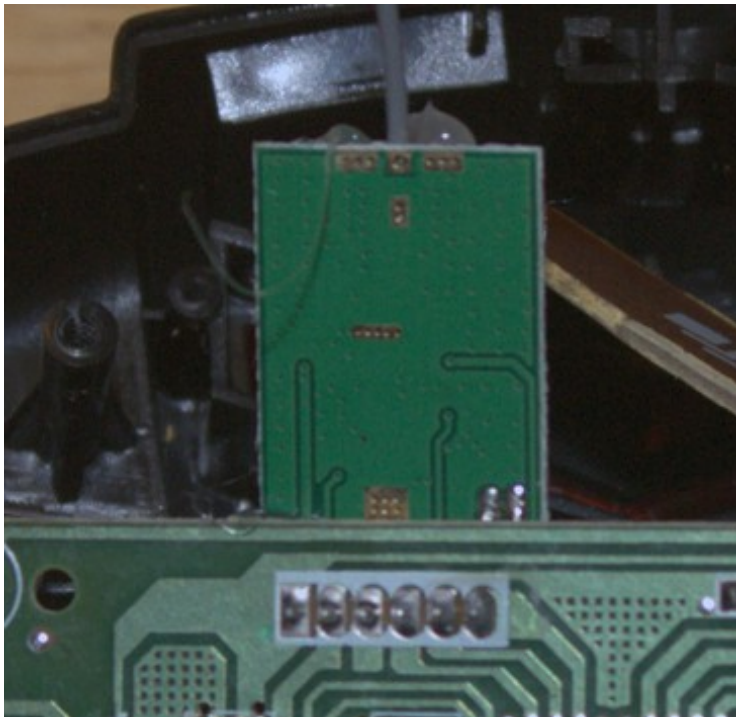
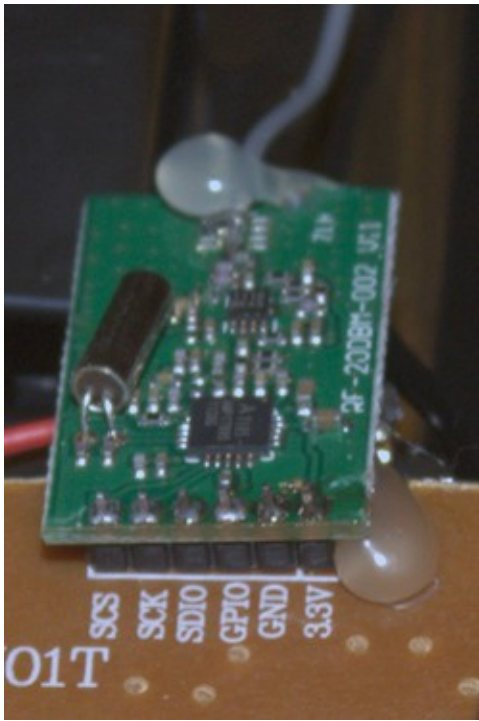
Once the screws are removed, pull the antenna off; it will be tight, but will come off once the screws are removed.

Next, remove the 8 screws shown below that hold in the main circuit-board and LED-board. At this point, it should be possible to pull the main-board away from the transmitter case.



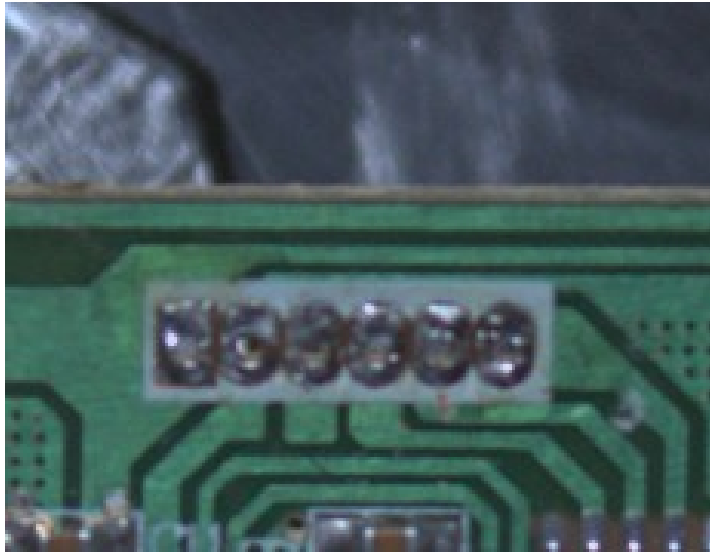
### ***Step 2: Remove the A7105 transmit module***

Now that the main board is fully exposed, it is time to remove the A7105 transmit module



The easiest way is probably to use a hack-saw or wire-cutters to cut out the module. If this method is used make sure none of the pads are sorted together when finished.

Alternatively using a solder-sucker syringe or solder-wick, the module can be de-soldered and cleanly removed.



# Removing an CC2500 module from a Skyartec 701

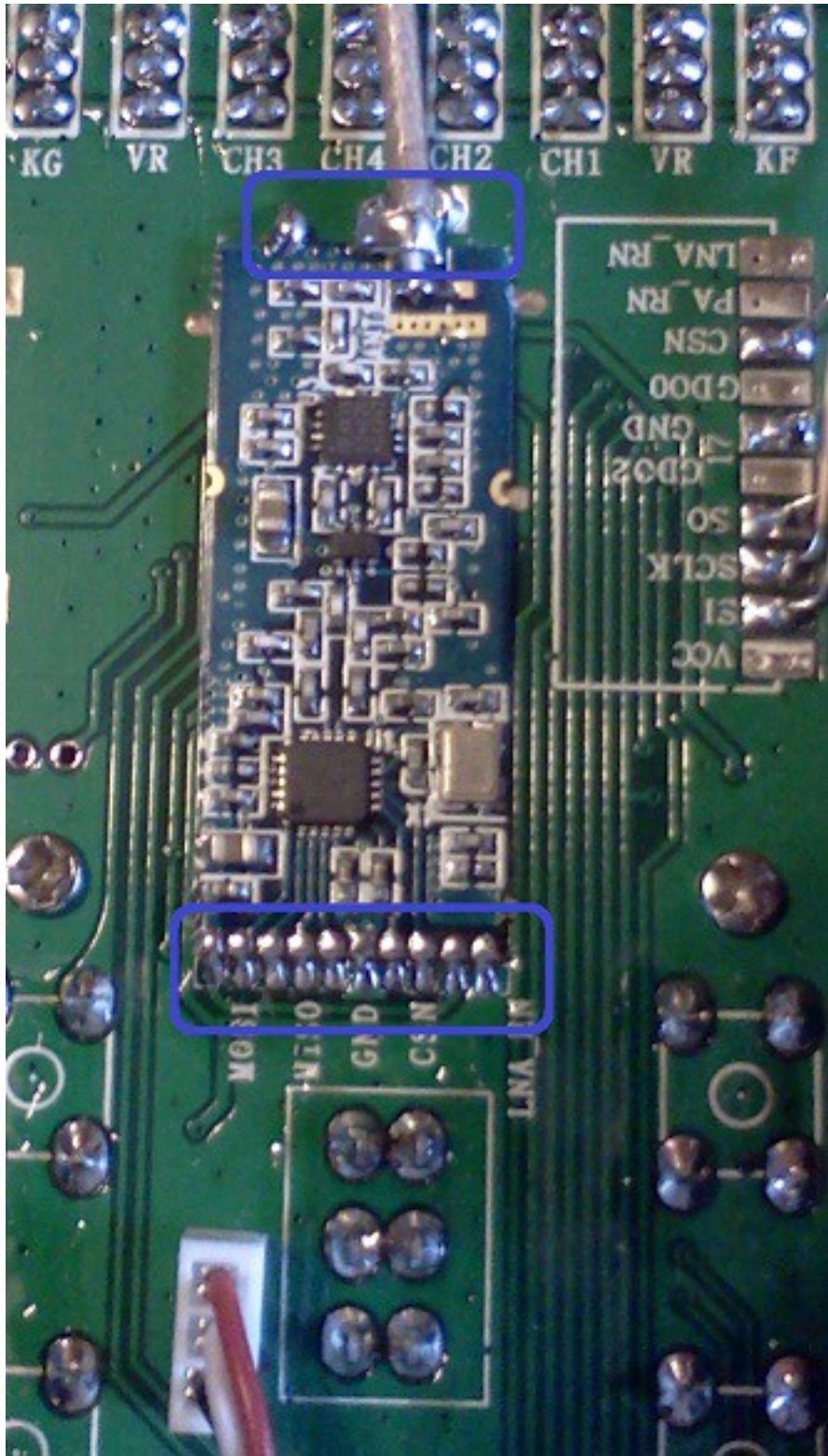
## ***Step 1: Disassemble the NASA701 transmitter***

The 1<sup>st</sup> step is to remove the back cover from the Skyartec transmitter. Remove the 9 screws from the back of the transmitter as well as the rubber sides.



## ***Step 2: Remove the CC2500 module***

Using a soldering iron with solder wick or a solder-sucker remove all solder connections to the CC2500 module. Removing enough solder to be able to remove the module will likely be difficult without wick or a sucker.





## Prepare Devo Transmitter

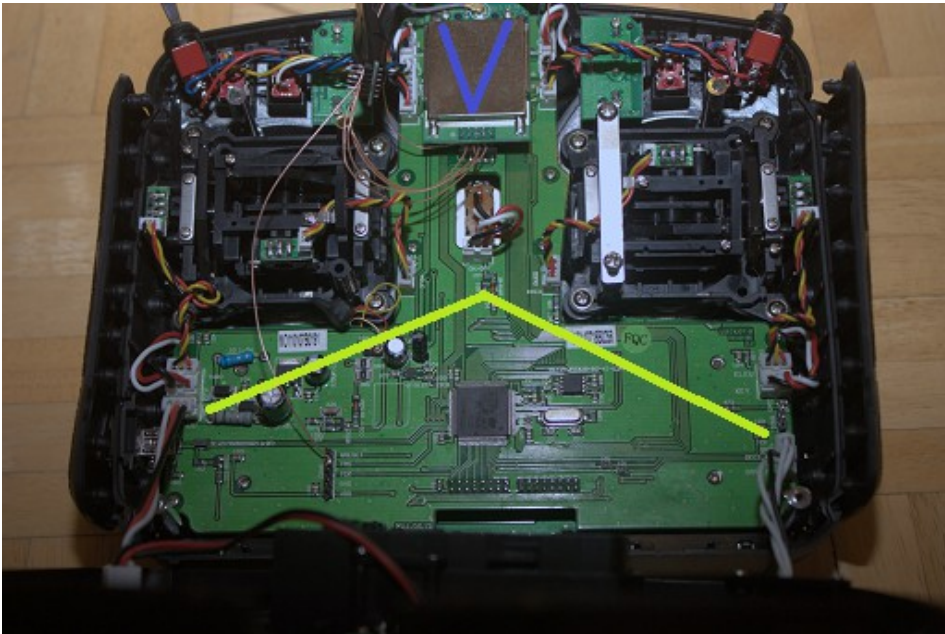
The following images were taken of a Devo8 Transmitter, but the steps will be identical for any transmitter with a removable radio module.

1<sup>st</sup> Remove the screws from the back of the Devo Transmitter



There are 5 screws on the back of the Devo8. It may be necessary to use a knife to cut through tamper-sticker on the bottom.

Once open, I recommend disconnecting the 2 connectors that go to the back panel to make things easier. This isn't strictly necessary though. Also, remove the 2 screws securing the CYRF6936 module, and remove the module from the transmitter.



## Install the New Module

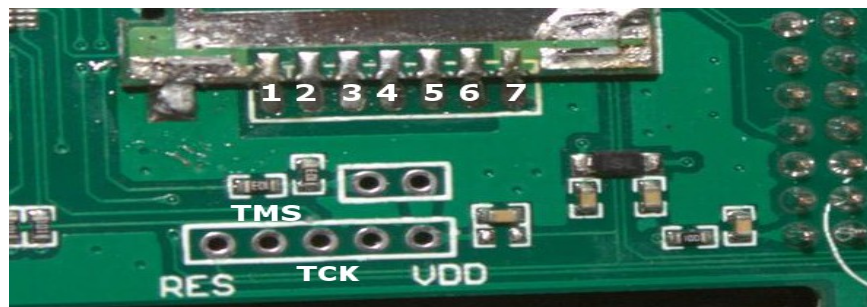
Now that all the prep work is done, it is now time to connect the new module to the Devo Transmitter. Three wires will be connected from the Devo's CYRF module to the new module, and two additional wires will be connected directly from the new module to the Devo transmitter debug port

You can connect up to two additional modules. The 1<sup>st</sup> module should be connected to the TMS pin, and the 2<sup>nd</sup> module to the TCK pin. You can configure the Deviation firmware to indicate which module is connected to which pin.

The connections are as follows:

Pin Func	GND	3.3V/V <sub>dd</sub>	SCS	SCK	MOSI	MISO
CYRF Module (Devo 6/8/10/12)	3			2	4	5
CYRF (Devo7e)	7			2	3	4
DEVO PCB Pins		VDD	TMS or TCK			
V911	5	6	1	2	3	N/C
XL7105-D03 →	3 (GND) 8 (RXEN)	1 (V <sub>cc</sub> ) & 9 (TXEN)	2 (SCS)	4 (SCK)	5 (SDIO)	N/C
Skyartec	6 (GND)	1 (V <sub>cc</sub> ) & 9 (PAEN) & 10 (LNAEN)	8 (CSN)	3 (SCLK)	2 (SI)	4 (SO)
XL2500-D03	6 (GND)	1 (V <sub>cc</sub> ) & 10 (PAEN)	2 (CSN)	8 (SCK)	9 (SI)	3 (SO)
CC2500-PA	6 (GND)	1 (V <sub>cc</sub> ) & 9 (PA_EN) & 10 (LNA_EN)	8 (CSN)	3 (SCLK)	2 (SI)	4 (SO)

NOTE: Pay careful attention to the orientation of the modules in the picture below with respect to how the pins are numbered. The pins are numbered left-to-right, then top-to-bottom when looking at the FRONT of the module. If you connect to the rear of the module, make sure you hook up to the right pins!



*Devo7e Pin Numbers and Labels*



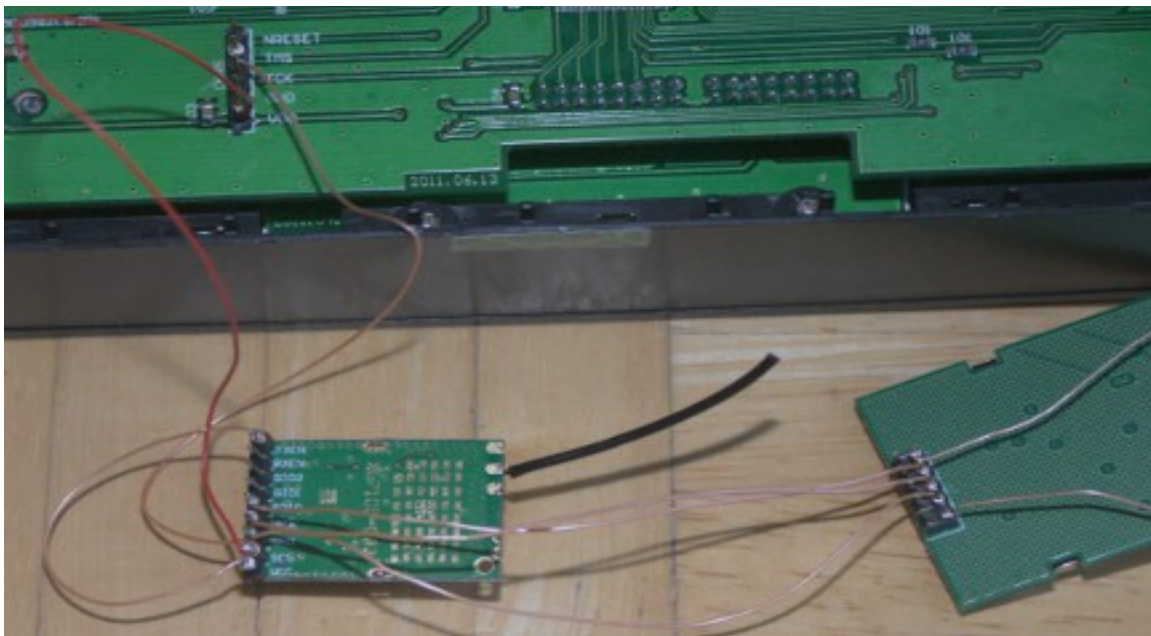
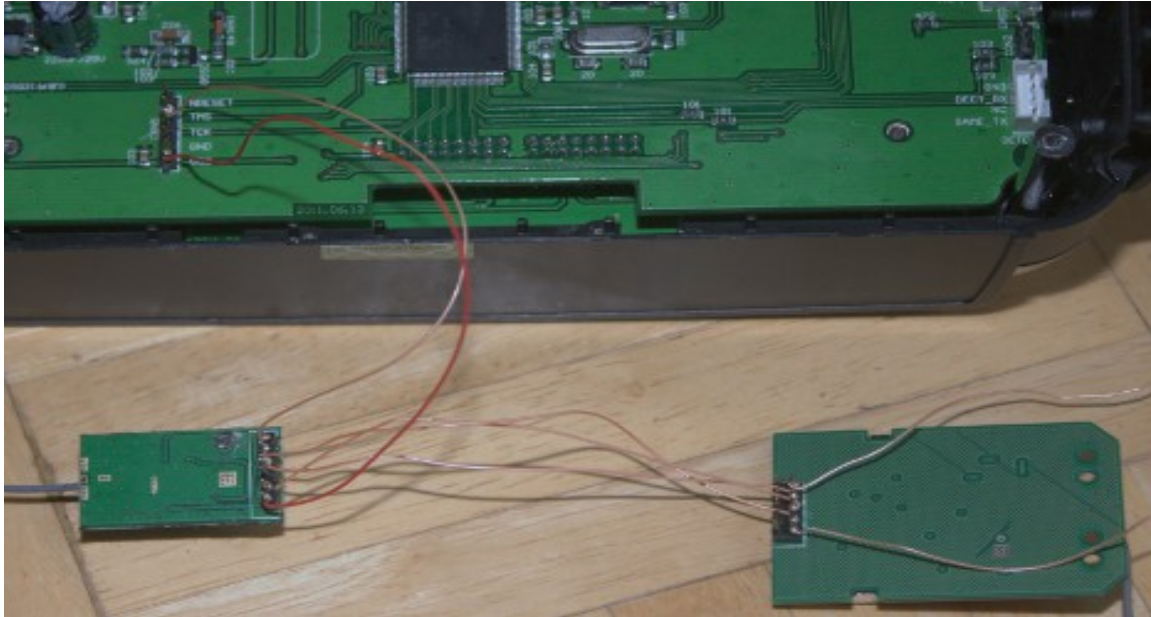
On my transmitter, I've used 30 AWG wire, and a wire-wrap tool to secure the new module to the transmitter. This is easily removable, but requires the use of a wire-wrap tool, and corresponding wire. I have also soldered standard 0.1" spacing headers into the debug port of the Devo8 (This is where the 'TMS', 'TCK', and 'VDD' pins are located).

As an alternative to wire-wrap, it is fine to solder wires between the 2 modules. If you are soldering, make sure to solder the top of the board, not the bottom. In the end you still need to be able to plug the CYRF module back into the Devo8.

On my Devo8, the TMS, TCK, and VDD pins are labeled on the circuit-board, but I have also seen boards without the silk-screen. In that case, the TMS pin is the 2<sup>nd</sup> pin from the top of the debug port (5 evenly spaced pads near the lower-left of the circuit-board), TCK is the 3<sup>rd</sup> pin from the top of the debug port, and VDD is the bottom most pin.

On the Devo7e, the CYRF6936 is soldered directly to the main-board, and the TMS and TCK pins are not labeled. The following image shows the pins and labels. Refer to the image and table above for the connections.

Be aware that the TMS and TCK pins are directly connected to the MCU. There is no buffering on these pins. As such you should probably discharge any ESD buildup first (ground yourself and your soldering iron). I didn't do that myself, but you've been warned.



## Step 5: Test and Secure Modules

Once all wiring is done, before securing everything, test that the module is working properly.

1<sup>st</sup> edit the tx.ini file on your transmitter (You cannot use 'notepad' for this. I use 'pnotepad' which can be found via Google, but 'write' should work as well)

You need to find the '[modules]' section and set the 'enable-a7105' or 'enable-cc2500' as follows:

- Using TMS: 'A13'
- Using TCK: 'A14'

Also make sure the corresponding 'has\_pa-a7105' or 'has\_pa-cc2500' is set to '1'

Now try to bind the Transmitter to a receiver, and ensure things are working as expected (make sure to attach an antenna if your module has a detachable one)

Once things are working, wrap the A7105 module with tape or equivalently make sure to protect the pins so they cannot short to anything within the transmitter. Next tape or hot-glue the A7105 module near the existing CYRF6936 module. It is not necessary that the antenna exit from the transmitter, but I would recommend that the antenna is oriented either up or down.