

IC-9100: Hardware modification for PTT and CW keying via USB cable using the RTS and DTR signals of the virtual COM ports.

Or: "Why ICOM hasn't done it."

Note! Before you do anything, please read this:

Warning: If you have any doubts, do not perform the modification or let someone with the technical knowledge do this. If you try the modification on your own equipment, it's on your own risk of damaging parts and losing warranty. My IC9100 is older than two years and have no warranty or whatsoever anymore.

Many IC-9100 users complain that the RTS and DTR signals of the two virtual COM ports have no function. PTT can only be switched via a CI-V command and some ham radio software like WSJT doesn't support that command. After some studying of the service manual I found out that the two chips IC901 and IC903 have those signals. These ICs are CP2102GMR USB BRIDGE (Figure 1) with this Pinout Diagram see Figure 2.

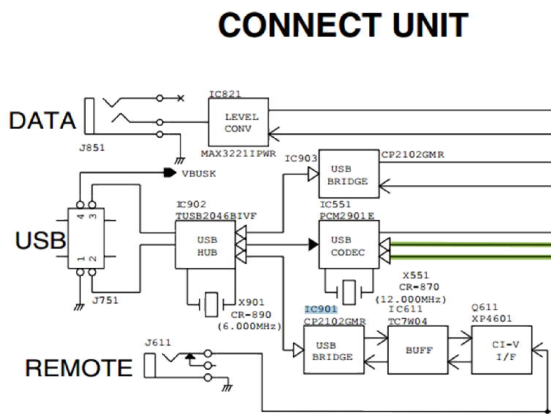


Figure 1 Block Diagram at Page 132

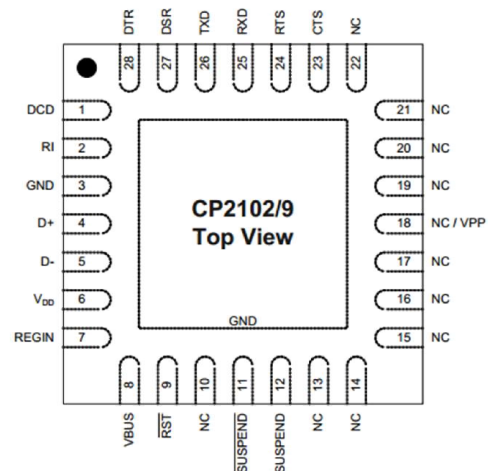


Figure 2. QFN-28 Pinout Diagram (Top View)

Those RTS and DTR signals are connected to the CTS and DSR signals, as you can see in the voltage diagram at page 138 and in the board layout at page 109 (Figure3). A test with a sufficient RS232 software like "RS232 Analyzer" confirmed this. So RTS and DTR signals are available on the connect unit, so let use them for keying.

Again looking at page 109 of the service manual the CW KEY connector is right next to the IC901. That's great, but it gets even better! There are unused pcb tracks, vias and unequipped solder pads for SMD components between IC901 DTR pin and the CW KEY connector. What a surprise, like ICOM wanted to add this feature but didn't get it working right and just left the SMD pads unequipped (Figure 4).

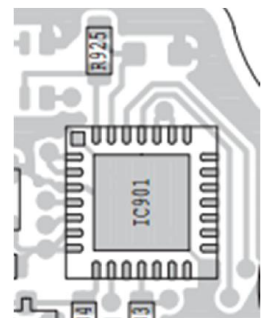


Figure 3: IC901 Layout

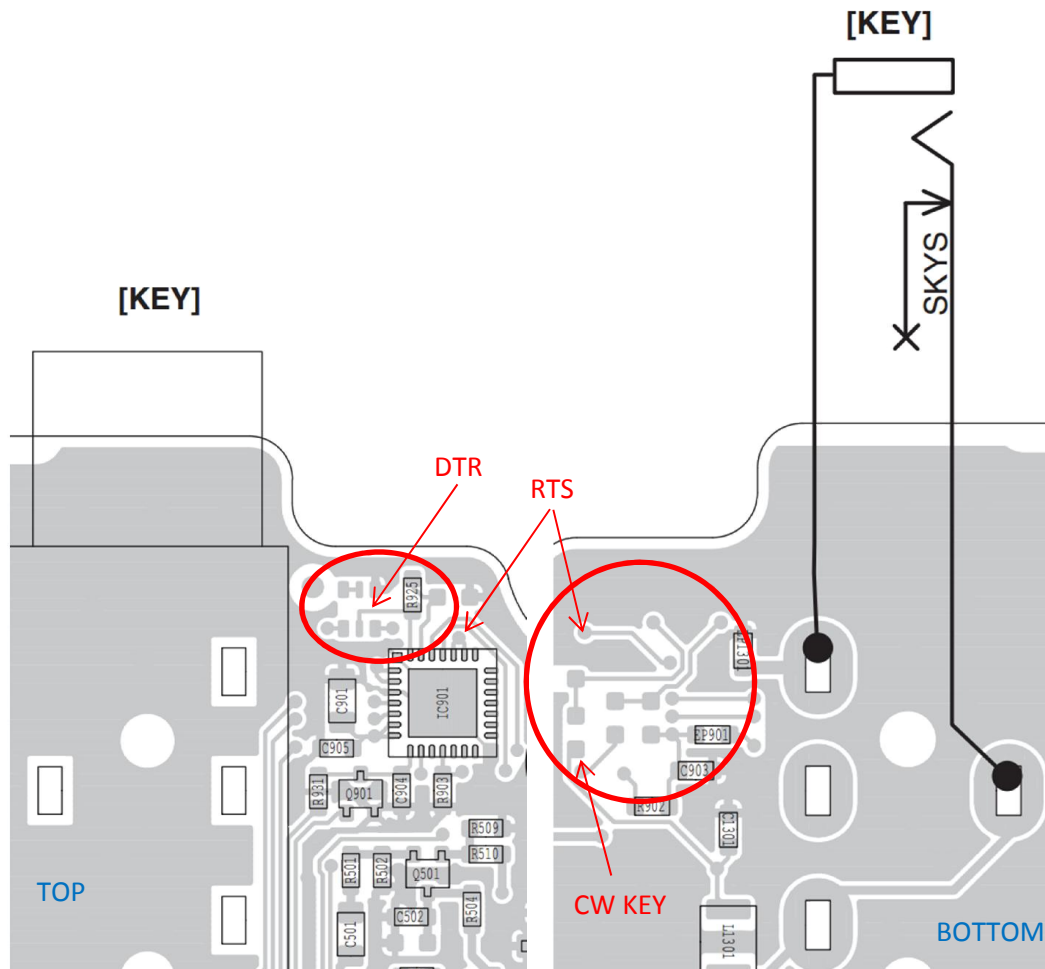


Figure 4: Unused layout red circles

1st try:

Okay, we have the DTR signal and the CW KEY signal, many people using these signals and a simple interface like this:

http://www.win-test.com/IMG/gif/Schema_COM_InterfaceCW-2.gif

I soldered a resistor and a general purpose transistor on the unused layout and tested the functionality. (I did the mod for PTT keying via RTS signal at the same time)

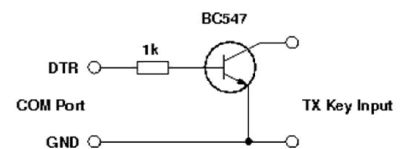


Figure 5: Simple interface

I turned on the IC-9100 and nothing happens, so far, so good. But when I connected the USB cable or turned on the PC the transceiver started to transmit. Now if a ham radio software switched the RTS signal to key the PTT of a transceiver the IC-9100 stopped transmitting. That means the RTS and DTR signals are inverted and I have to revise my modification circuit.

2nd try:

To invert the signal I just used another resistor and transistor. But now I need a voltage supply for the circuit. I used the output pin of IC1011 5V REGULATOR, which is connected with a thick red wire, as you can see in Figure 6.

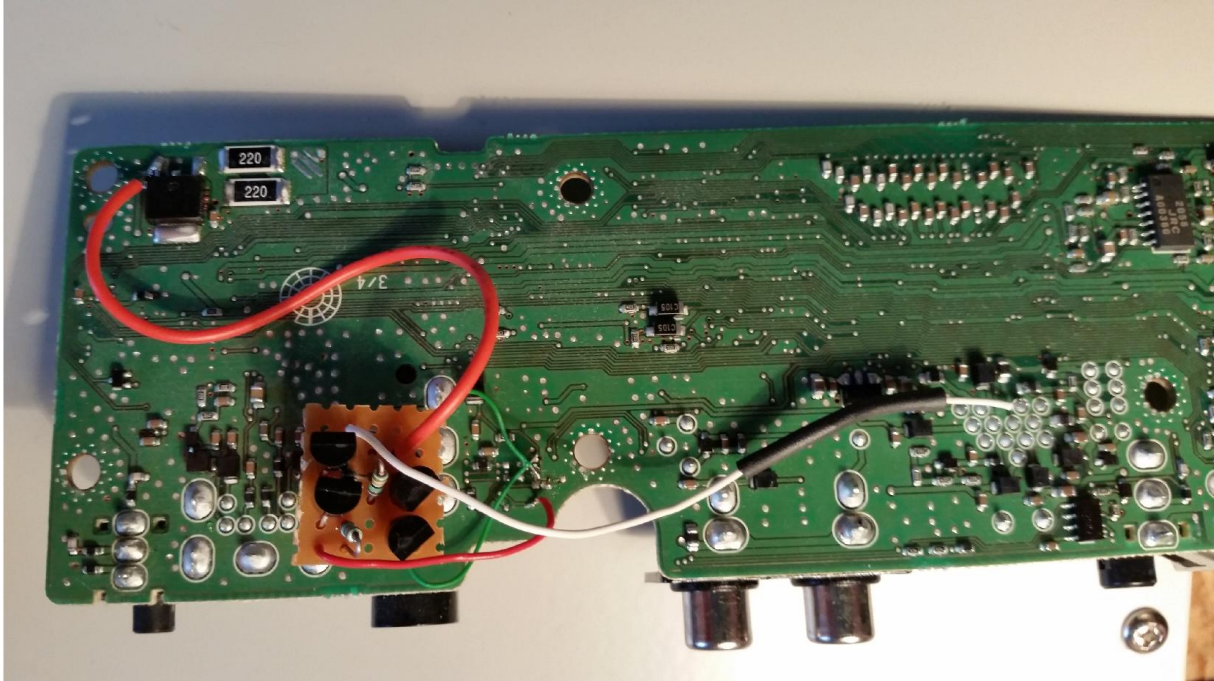


Figure 6: CONNECT UNIT with modification circuit (Note: The thicker red wire is connected wrong for final modification)

Now the behavior is vice versa to that one in the first try. That means PTT and CW keying working properly, but only if the PC is running and the USB cable is connected. If not, the RTS signal and the modification circuit sets the transceiver to TX. I believe ICOM had the same trouble and just dropped that feature.

3rd try or final modification:

The modification circuit should only get supply voltage when the USB cable is connected and the PC is turned on. The solution was simple: just use the 5 Volt of the USB cable, instead the 5V of the IC1011. At the following figures you see the modification circuit and the connection points.

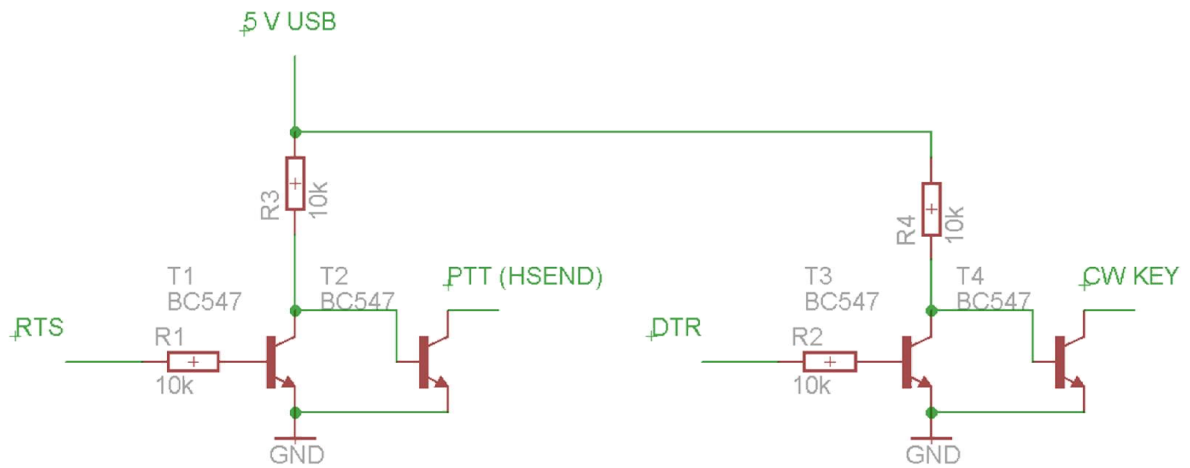


Figure 7: Modification circuit

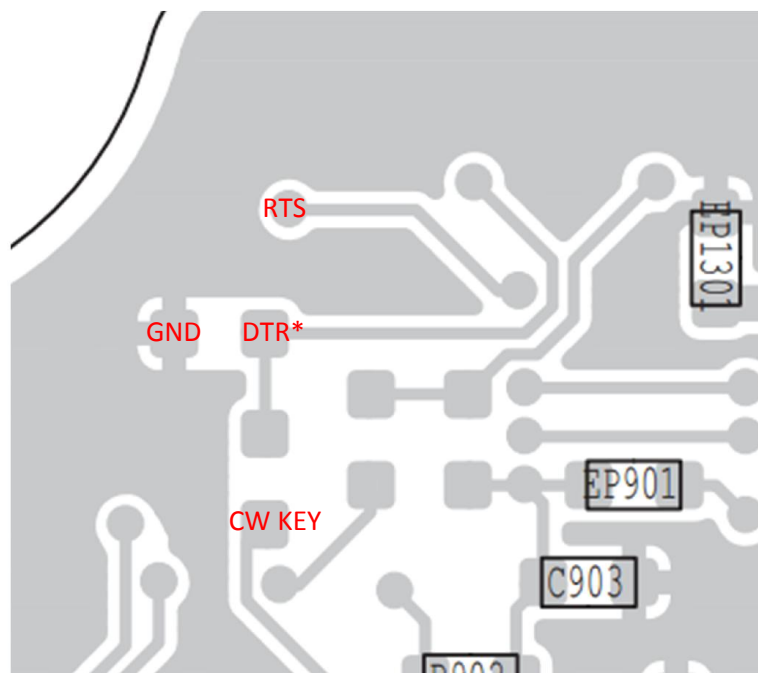


Figure 8: Connection point RTS, DTR* and CW KEY

*: DTR is only present when two solder pads on the TOP layer are bridged (or you can install the first 10k Ohm resistor between the pads)

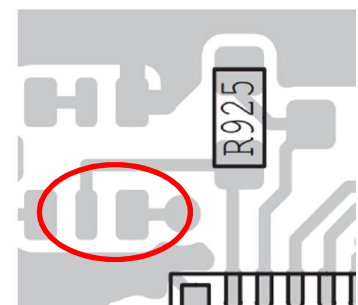


Figure 9: solder pads must be bridged or equipped with the first 10k Ohm resistor

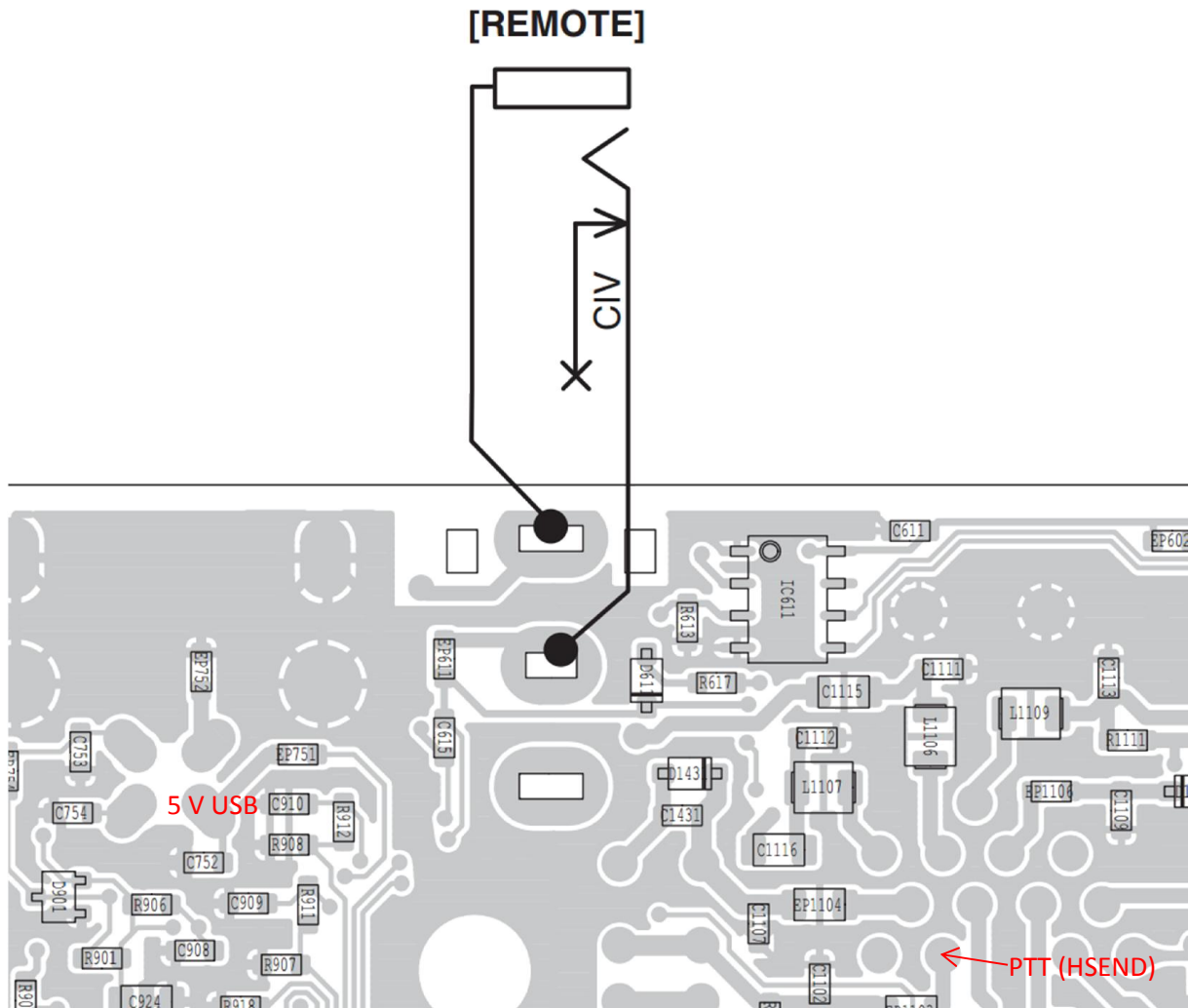


Figure 9: Connection point 5 V USB and PTT (HSEND)

To install the circuit remove the 18 screws, the bottom and top cover, (remove the 23cm modul if present), take off the four cables connected to the CONNECT UNIT and then remove the screws that hold the CONNECT UNIT board. Don't forget the screw at the rear panel. Then lift the board out of the chassis and you can see there is only a little space under the CW KEY, DATA2 and DATA1 connector for mounting the modification circuit.

I hope you enjoy your IC-9100 with this additional feature. For those who cannot or don't want to modify their transceiver there is also a software solution by ND0B called "ICOM Keyer.exe", which can be found in the file section of the IC9100 yahoo group. vy73 de Hans dc1rjj