

Wide Pan-Adapter Output for the TS-2000

by Carsten DL7CG

There are several modifications to access the lower IFs (intermediate frequencies) of the TS-2000. One common application is to build cheap pan-adapters / band-scopes by using SDRs (software defined radios) like the SoftRock or similar devices.

Most modern radios including the TS-2000 got roofing filters. They limit the pass-band of the first IF stage of the radio, so the following amplifier stages and mixers don't get overloaded by strong signals.

Unfortunately, with such a roofing filter, the bandwidth of the lower IFs and therefore the panoramic display will only be a few kHz wide. The only way to avoid this limitation is to take the signal before it gets filtered by the roofing filter.

The TS-2000 got two frequencies (75 MHz and 69 MHz) at the first IF stage, depending on what short wave band is selected. This will be out of range for most short wave SDRs, but fortunately there are some cheap DVB-T receivers on the market, which cover that frequency area very well. They can be used as a scanner, too, and only cost a few bucks. Search for "RTL USB dongle" at Google or Ebay. You get the needed software for free, "HSDR" for example can be used as a panadapter software and even allows remote-controlling the TS-2000. See <http://www.hdsdr.de> . If you prefer Linux, "Gqrx SDR" might be a good alternative. See <http://gqrx.dk/>

The signals at the first IF are rather weak, and therefore it is not a good idea to connect the SDR input directly to that stage. This would reduce the sensitivity of your radio and probably make it deaf. So you need a small buffer amplifier board in-between, with a high impedance at its input. Jack Smith offers such a board, called "Z10000". You will find it here:

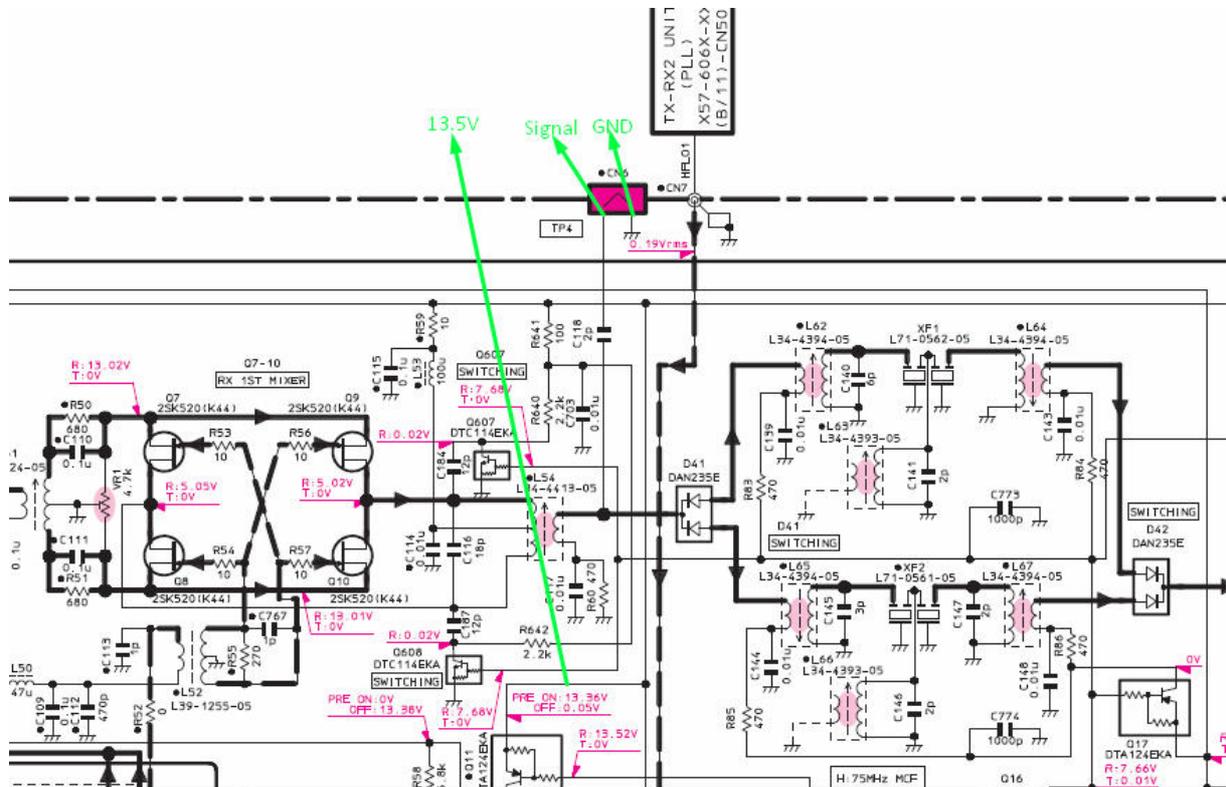
http://www.cliftonlaboratories.com/z10000_buffer_amp.htm

Because the board is rather small, shipping to Germany (and probably to other countries) take only about 2 US\$.

Before we start, you should be aware that there are some smaller issues with this solution:

- Some SDR dongles do not have a good AGC (Automatic Gain Control). It might be necessary to adjust the gain by hand.
- Because of the missing roofing filter your SDR dongle is not protected against strong signals. Especially on the lower bands some AM radio stations really produce big signals. It was necessary to turn off the Pre-Amp of the TS-2000, and reduce the gain of the SDR dongle to "0", otherwise the panoramic display showed a lot of "ghost" stations all over the band, mirrored from somewhere else.
- Depending on the band, the panoramic display sometimes shows two valleys, one a few kHz above and the other a few kHz below the centre frequency. They are probably produced by the following roofing filter. It is probably impossible to avoid these two valleys

Fortunately the output of the first IF stage is available at a board connector (CN6). And the power supply for the small amplifier board can be taken from a line, which gets turned off during TX. So the board can't pick up any unwanted signals.



ATTENTION: Though installing the board is not very difficult, you do this at your own risk. I'm not responsible for any damage, unwanted side-effects or whatever.

How to install:

1. Remove the bottom cabinet of the TS-2000. You should see the TX-RX 1 board. The front of the radio should point into your direction.
2. Locate connector CN6. It is the test point TP4. Push both pins to the back of the radio, so that they have about 45°. Locate Q11. It is to the right of CN5. See "Component side view" below.
3. Solder a small red wire to the upper left of the three pins of Q11. This will be the power supply for the amplifier board. See "Picture 1" below.
4. Pinch or saw off the corner of the amplifier board where the mounting hole is located.
5. Solder a RG174 cable to the output of the amplifier board, and find a way to get the signal out of the radio. If you don't have the 23cm option installed, you can go out there. If you don't need the RX-only antenna input, you can remove the Cinch jack and put in a BNC jack.
6. Put some duct tape over the "EXT Cont." connector of the TS-2000, just to be sure that there are no short-circuits.
7. Put in the amplifier board, as shown on "Picture 2" below, and solder the two pins of the CN6 to the amplifier board.
8. Solder the red wire to the power supply pad of the amplifier board. Check for any short-circuits! Make sure that you did not accidentally took the GND pad!

9. Put some duct tape onto the bottom cabinet where the amplifier board is located now, just to be sure that there are no short-circuits.
10. Attach the bottom cabinet. That's it.

Tune your SDR software to one of the following frequencies, depending on the band:
f1: 75.925 MHz (160m, 80m, 40m, 18m, 15m, 10m)
f2: 69.085 MHz (30m, 20m, 12m, 6m)

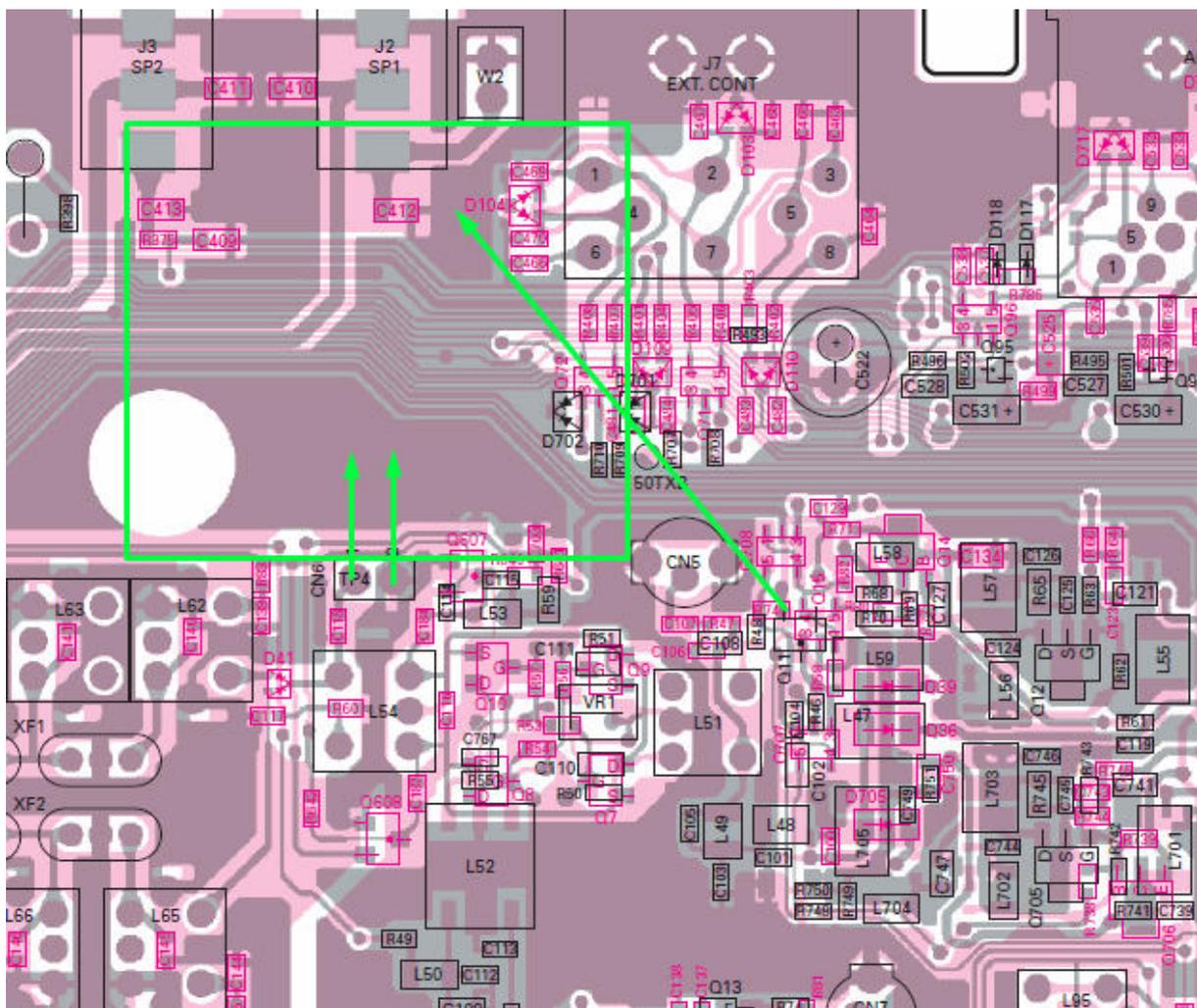
Your dongle might be a bit off frequency, so you will probably have to do some fine tuning. Remember to reduce the gain of your SDR dongle, if you see "ghost" stations or any other distortions. Turn off the Pre-Amp for 40m and below. I also had to swap the I/Q signals of the dongle.

Please visit my website to leave some comments in my blog:

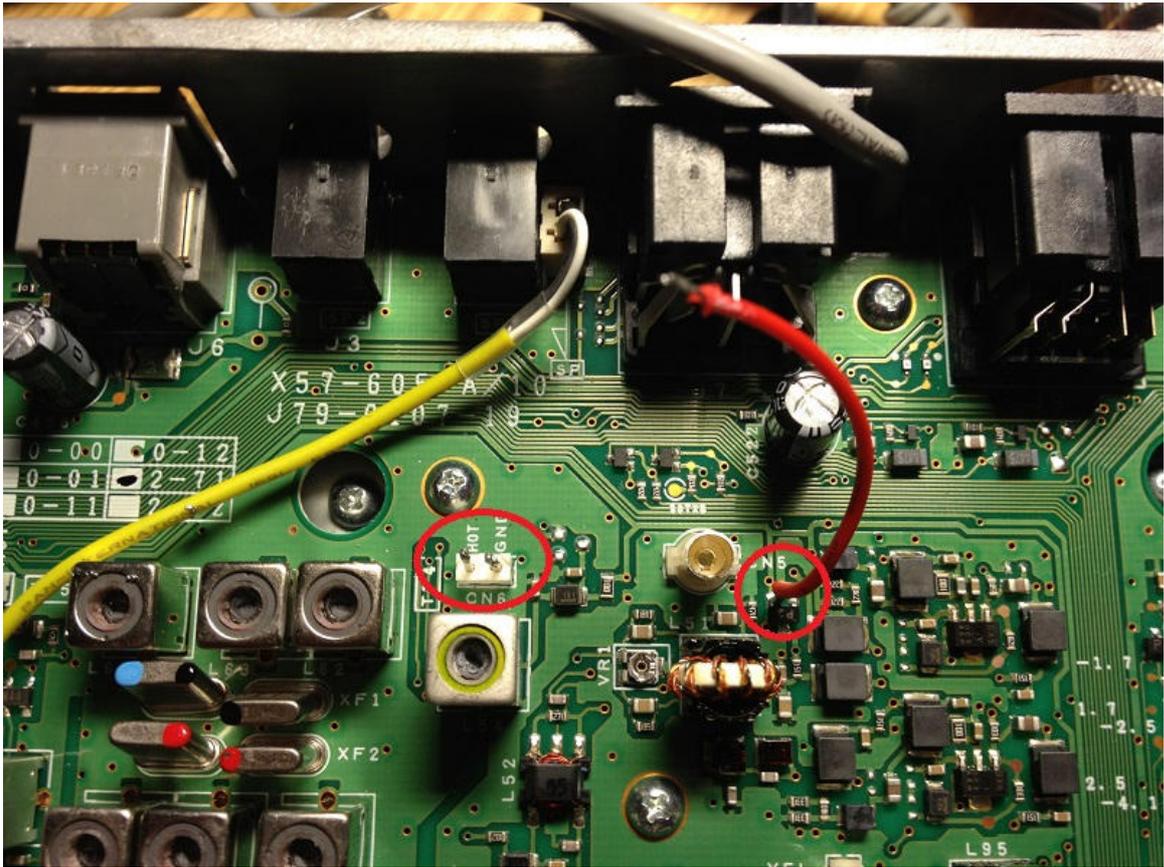
<http://dl7cg.wunstorf-luthe.de>

Have fun!

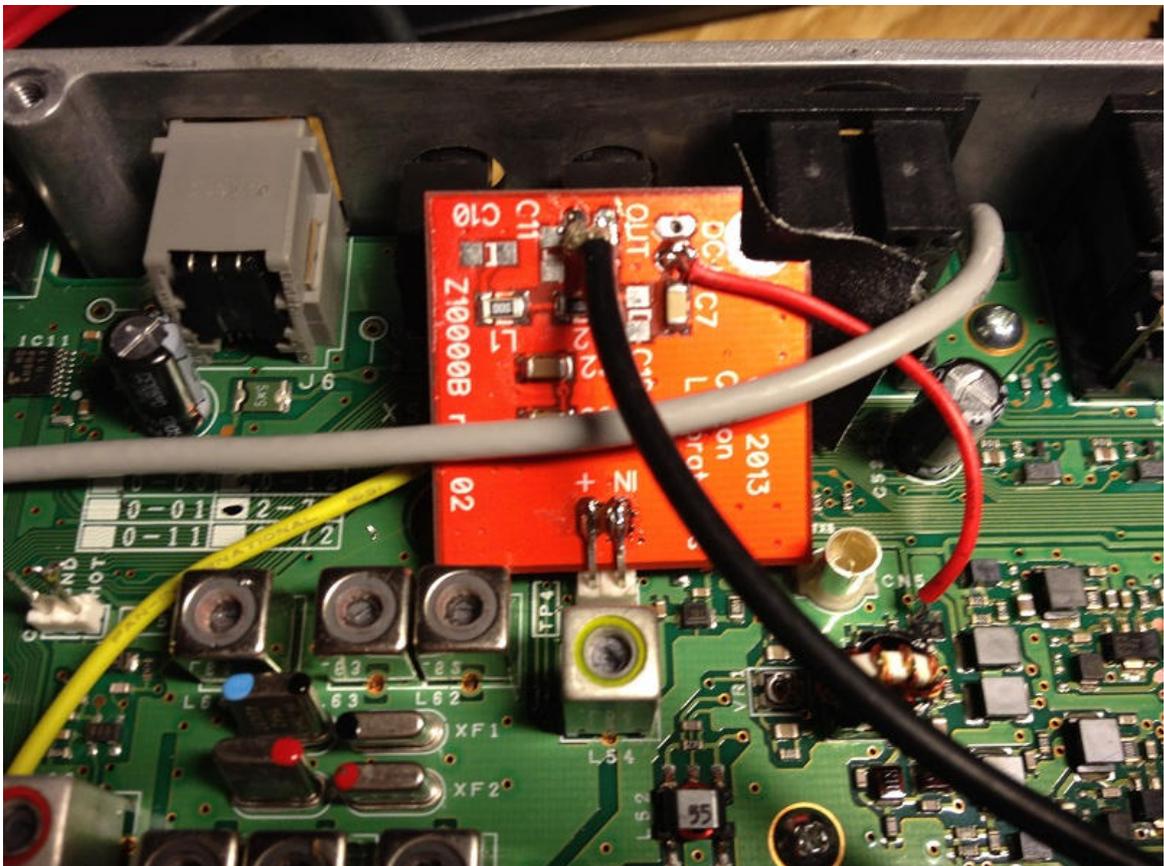
73 de Carsten DL7CG



Component side view



Picture 1



Picture 2