

Kenwood TS-590S RX OUT adapter cable

Introduction

The TS-590S packs a lot of value in a compact, well designed package, but does not have an IF out connector for use with a panadapter. The TS-590S uses a novel approach of both up-conversion for most frequencies and down-conversion for five of the ham bands. Different IF frequencies are used in these conversion methods. This makes it difficult to implement an IF panadapter.

This paper describes how to make a simple Receiver Out (RX OUT) adapter cable for the TS-590S, so a second receiver can be connected and used as a panadapter. This enables the second receiver to use the same transmit antenna and receive antennas that the TS-590S internal receiver uses.

Using a Software Defined Radio such as the SoftRock RX Ensemble II Receiver Kit for the second receiver adds a number of features to the TS-590S.

-An RF tracking panadapter. When used with the SDR-Radio software, changing frequencies is a simple point and click affair. When the TS-590S tuning knob is turned, the SDR can track right with it. Up to 192 kHz of band width can be viewed on large high resolution screen.

-A second receiver. The Software defines what you can get with the second receiver; sharp filters, audio tailoring, notch filters, and noise reduction can be implemented through the software.

-Computer control of the TS-590S. Software allows the user to change modes, bands and tune the TS-590S.

-Potential low cost. If you have the PC and a sound card, the cost can be minimised. The SoftRock can be built from a kit, although built units are sometimes available on the website. The SoftRock does need a buffer amp to isolate it from the TS-590S. A simple, inexpensive amp is described in this paper.

-Other options. Not only can the SoftRock be used, but other SDRs such as the SDR-IQ and Perseus could be used, at a higher cost, but with no assembly required. Other SDRs may not require the isolating amp.

-A very important feature. Use of this cable requires no hole drilling and no soldering to the TS-590S. Bob, W7KWS developed this approach.

Caution! Proceed at your own risk! Be very careful when using the adapter cable, There is no protection for the TS-590S at the point in the rig where the cable is connected. Large RF signals or even relatively small levels of DC voltage can damage the TS-590S receiver!

Refer to your manual or dealer for any possible warranty limitations for this procedure. Download Manuals

Download Manuals

Download a copy of the "TS-590S In-depth Manual":

http://www.kenwood.com/i/products/info/amateur/software_download.html

The manual provides a lot of detail about the operation and development of the TS-590S. Go to page 10 in the manual, Section 1.4, "RX Auxiliary Circuits". Locate CN101. It utilizes a two-pin jumper that allows the

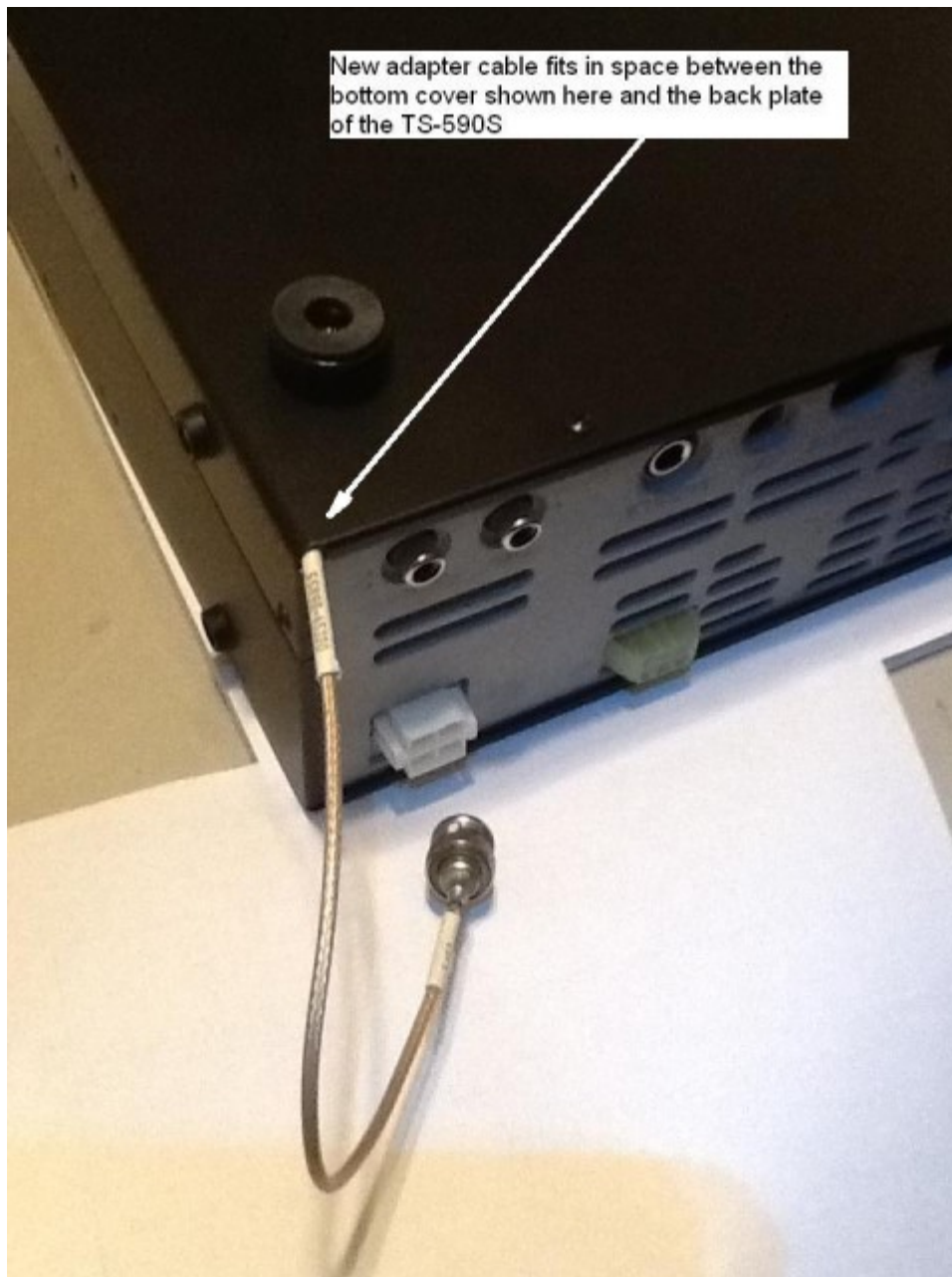
user to change the amount of attenuation available when the ATT button is pressed on the front of the rig. Leaving out the jumper increases the attenuation, but it is also a handy location to attach our adapter cable. In the approach used in this paper, the stock attenuation level is not affected.

Now download the [“Kenwood TS-590S Service Manual”](#)

See the schematic on page 128, and notice CN101 at the upper left hand of the TX-RX Unit. This jumper at CN101 is connected at a point on the receiver side of transmit/receive relay K101.

Making the Adapter Cable

Here is a picture of the adapter cable. It fits through a gap in the case of the TS-590S, between the bottom cover and the back plate.



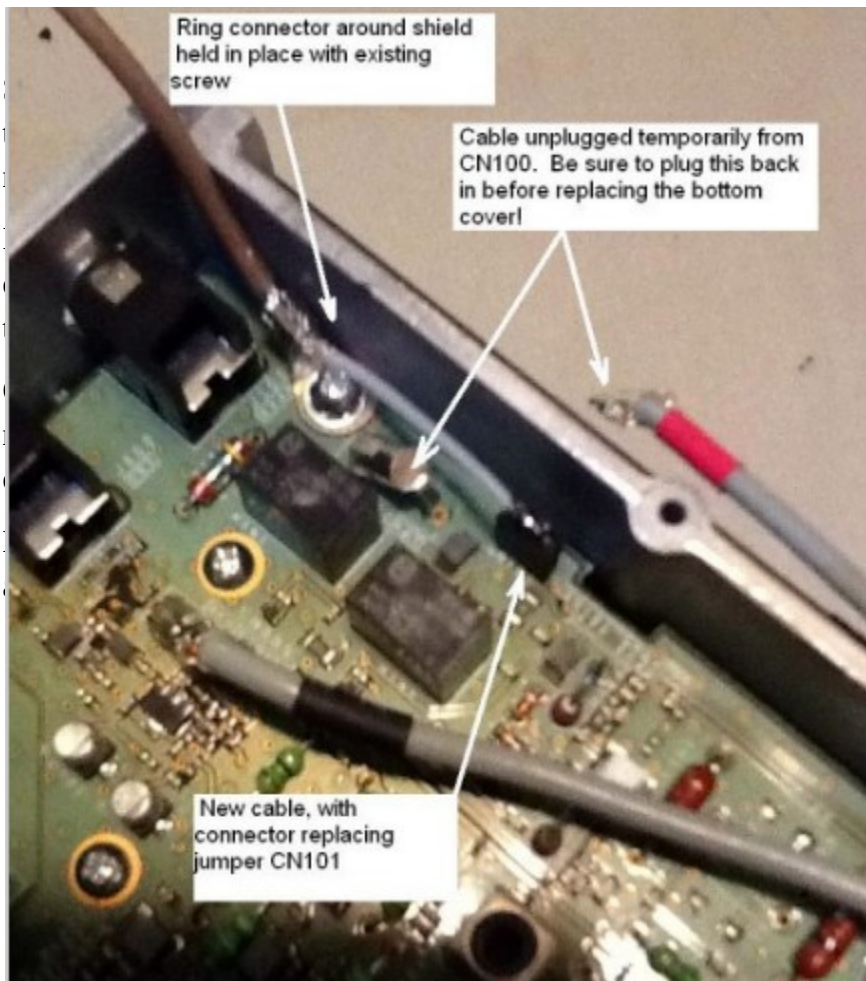
Turn the rig over and remove the bottom cover. You will be looking toward the rear of the rig where the RX ANT jack is located. Obtain a piece of PTFE insulated RG-316 type cable with a BNC on one end. A number of RG-316 jumpers will be for sale on ebay.

When you begin the process of the cable construction, do not skip this critical step: pass the cutoff end of the cable through the space on the corner of the lower cover. If you don't do this now before you make up the other end of the connector, you will have to start over. You can only get through this space in the bottom cover using the end of the cable with no connector on it.

Move the bottom cover to the side as you continue. Be sure to keep available the "TS-590S In-Depth Manual", page 10, Section 1.4, "RX Auxiliary Circuits".

Strip the outer insulation from the end of the cable. Look at the pictures of the installed adapter on the RX/TX board. Make sure you strip off enough insulation to complete this adapter. Trim the braid, leaving about 1/2 inch or so of it.

Slip a ring connector over the end of the cable onto the braid. Lightly crimp the connector onto the braid, being careful not to distort the coax. Now solder the ring connector on to the coax braid. The PTFE insulated cable is necessary to prevent heat damage to the center insulator of the coax. The ring will be held down by a screw on the RX/TX board (see picture). This screw is near the RX ANT connector, so use a ring connector to match this screw size.



and solder a two-pin, micro-header socket to the board. The socket is held in place by the available space.

Buy a "battery connector wire cable" on ebay and a "two-pin micro-header connector" that could be

used on top of the new socket. This socket is held in place by the two pins sticking up after the removal

of the mentioned screw will firmly hold the new cable in place. Tighten!



Replace the bottom cover. Your installation should now look like the first picture shown earlier, with the new adapter cable sticking out the back.

Broadband buffer amp

When connecting an outboard receiver to the TS-590S receiver, care should be exercised that the outboard receiver does not introduce noise into the TS-590S. This is especially important when using a SoftRock receiver for the outboard receiver.

An integral part of this arrangement is the broadband buffer amp. It is used to isolate the TS-590S from the SoftRock receiver. It is based on a circuit from “Experimental Methods in RF Design” by W7ZOI, KK7B and W7PUA. See pages 5.14 and 6.12.

The SoftRock uses a switching mixer that generates mixing products that leak through the SoftRock antenna connection. The SoftRock is a Direct Conversion receiver with the VFO tuned right at the carrier frequency of the signal being received. That strong VFO signal is also present at the SoftRock antenna connection.

The buffer amp provides about 40 dB isolation (almost 7 S-units) between the input and output of the amp. This dramatically reduces the signal levels from the SoftRock into the TS-590S receiver. The example shown here was built into an Altoids box.



The components and the phono connector were soldered directly to the tin case. A brass shield (tin could be used) isolates the input from the output. This shield is only soldered to the bottom of the case, and does not touch the sides or top of the case. The schematic is show below.

The 270Ω input resistor is used to minimize loading down the 50Ω nominal impedance of the TS-590S. The 1200Ω resistor across the binocular core adds stability to the circuit, as does the 22Ω resistor connection to the drain of the J310 JFET.

If you use a SoftRock receiver, be sure to use the buffer amp or a similar one to make this a successful endeavour. Clifton Laboratories has a commercial buffer amp that provides an advertised reverse isolation in excess of 70 dB. Note that if you tune close to the SoftRock VFO frequency, a strong carrier signal may still be noticed on the TS-590S, even with the buffer amp shown in this paper. In the SDR-Radio software, this

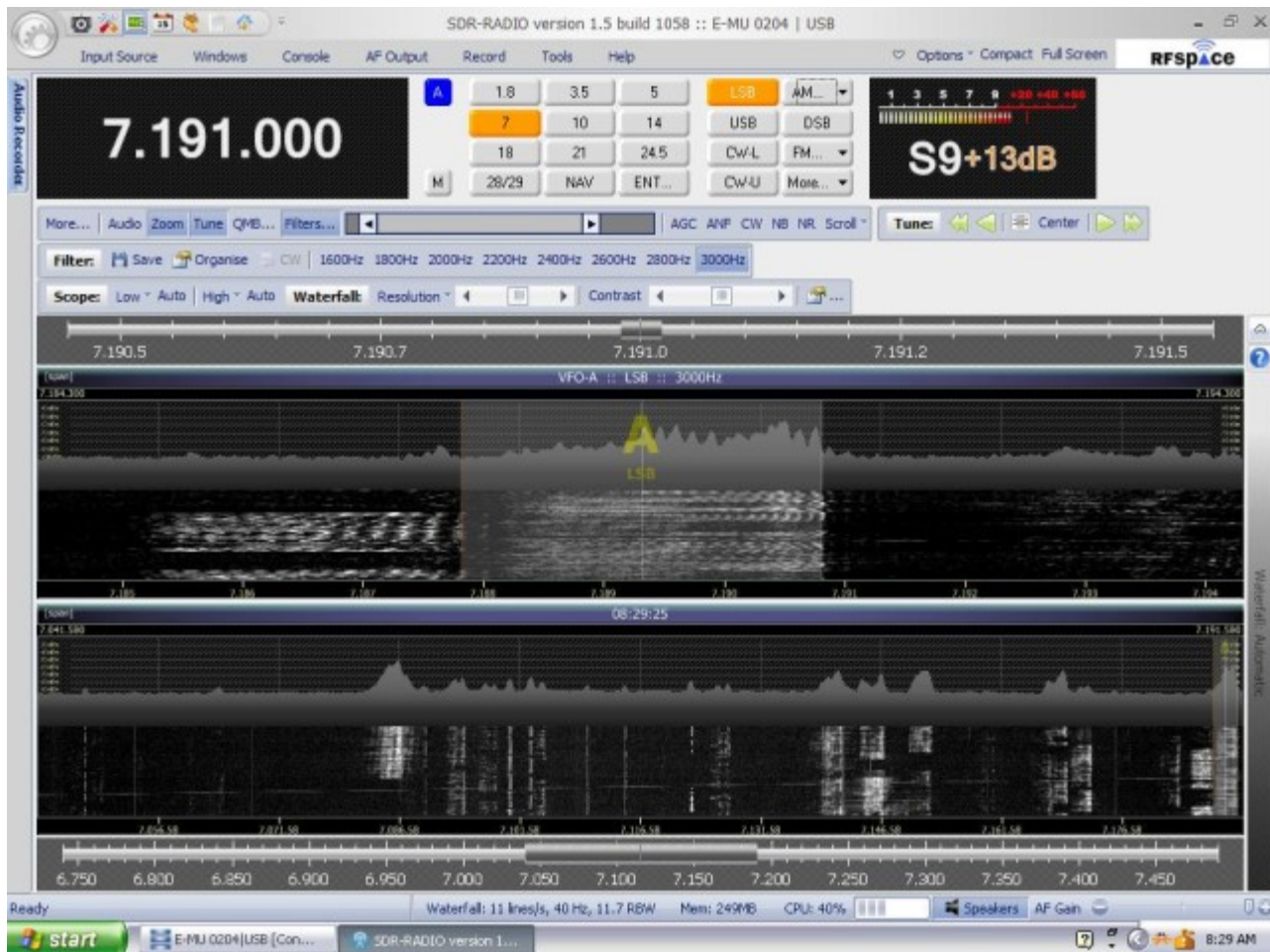
can be avoided by using the green Tune arrows on the SDR-Radio screen to offset the SoftRock VFO when tuning across a band segment. If additional isolation is still needed, the Clifton Laboratories unit should be considered.

<https://www.dxengineering.com/techarticles/dxpressreleases/dx-engineering-acquires-clifton-laboratories>

Another Control Program: SDR-Radio

I alternate between HDSDR and the SDR-Radio v2.3 Release build 2760 software by Simon Brown of Ham Radio Deluxe fame. The software can be downloaded at: <http://www.sdr-radio.com/Software/Downloads>

I found that this software uses less CPU processing than HDSDR. This frees up CPU processing for multitasking with various applications rather than just controlling the radio. It allows me to surf the web or use a chat room while still using the SDR-Radio control software. See the screen shot below.



Sound Cards

I have tried a number of sound cards over the several years that I have been using SDRs. The approach that works best for my small form factor PC is to use a combination of internal and external sound cards. In the application being discussed here, I use an external E-MU 0204/USB sound card connected to the SoftRock LINE IN jack.

My sound system is attached to the internal PC sound card. Note that the E-MU 0204 gives 192 kHz bandwidth for the panadapter. It is the best sound card I have used to date for this kind of application. I bought mine from [Autio-Topia](http://www.autio-topia.com) via ebay.

Summary

The new adapter cable combined with the broadband buffer amp provides an effective outboard receiver interface to the TS-590S receiver. Rather than being forced to use separate receive antennas for an outboard receiver or use an outboard relay, the approach described here is simple and effective way to share antennas with the TS590S receiver.

When the second receiver is a general coverage SDR receiver, such as the SoftRock RX Ensemble II Receiver, a very effective panadapter is readily implemented. The SoftRock now becomes a tracking-panadapter and second receiver, that tracks the tuning of the TS-590S, not at IF frequencies, but at the actual HF band frequencies.