

## *RIGblaster Pro*™ Rig Control Interface to the Kenwood TS-450S Transceiver

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### Background

This paper describes the rig control interface between the *RIGblaster Pro*™ (<http://www.westmountainradio.com/index.html>) and Kenwood TS-450S transceiver. This implementation makes minimal modification to the *Pro's* hardware and basically affects a logic level conversion using transistors located inside a 1/8" stereo phone/jack assembly. The completed interface is used to control the TS-450S transceiver with the *Writelog for Windows*™, Version 10.47, (<http://www.writelog.com/>) log & radio control program.

### Technical Overview

The rig control interface between the TS-450S expects the TTL Rx and Tx data lines to be inverted logic from the *RIGblaster Pro's*™ implementation. Adding transistor level inverters in the TTL Rx and Tx data lines is all that is needed as far as the logic is concerned.

There is one small problem with this method however. The *Pro's* design has a 0.033 uF capacitor across the TTL control input line to ground to act as a filter. This is a good design methodology and works when TTL circuits are driving the input to the *RIGblaster Pro*™. But, if a transistor pull-down inverter is driving it, a pull-up to +5VDC is needed. Normally, the level converting IC, DS14C232 (<http://www.national.com/pf/DS/DS14C232.html>), in the *Rig Blaster Pro*™ level converter circuit has a 5 Meg Ohm resistor pull-up to +5VDC ( $V_{cc}$ ) built into the IC itself. But with that 0.033 uF capacitor hanging off the input to ground, it cannot pull the logic level up to a logic one quick enough at the 4800 bps data rate of the control signal.

The solution is to add a 330 Ohm,  $\frac{1}{4}$  W resistor from the TTL receive input to +5VDC inside the Rig Blaster Pro. It does not hurt anything in normal operations, and acts as a pull-up to +5VDC supply when the externally mounted transistor inverters are being used (the two transistors are mounted in a small adapter cable that connects between the *RIGblaster Pro's*™ control output jack and the DIN [ACC-1] connector on the TS-450S).

### Cable Logic Inverter

This implementation allows the use of another interface cable should another radio be used that does not require logic conversion. The cable, shown in Figure 1, is built from a stereo plug cable assembly (Radio Shack 42-2497, 1 ft., shielded cable cut into half, <http://www.radioshack.com>) and a 3 conductor, stereo phone jack (Radio Shack 272-249, 1/8" phone jack). The inverting transistors are common NPN-type transistors (e.g., 2N2222, 2N3904, 2N4401, etc.) that were selected from a batch of transistor in Radio Shack part number 276-1617. Each base of the transistor has a resistor added in series to limit the current (I used values of 330 ohm,  $\frac{1}{4}$  W).

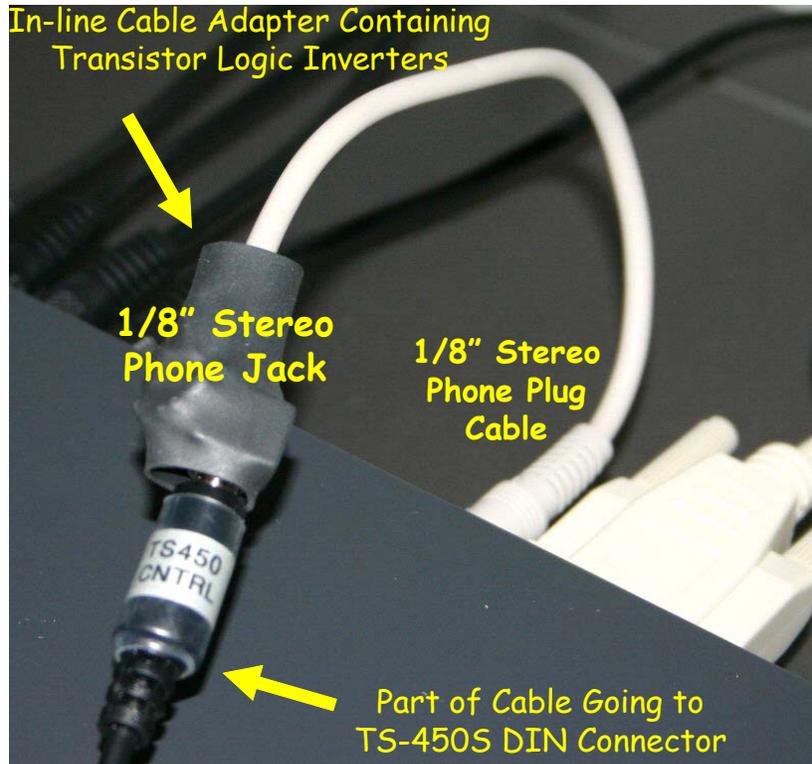
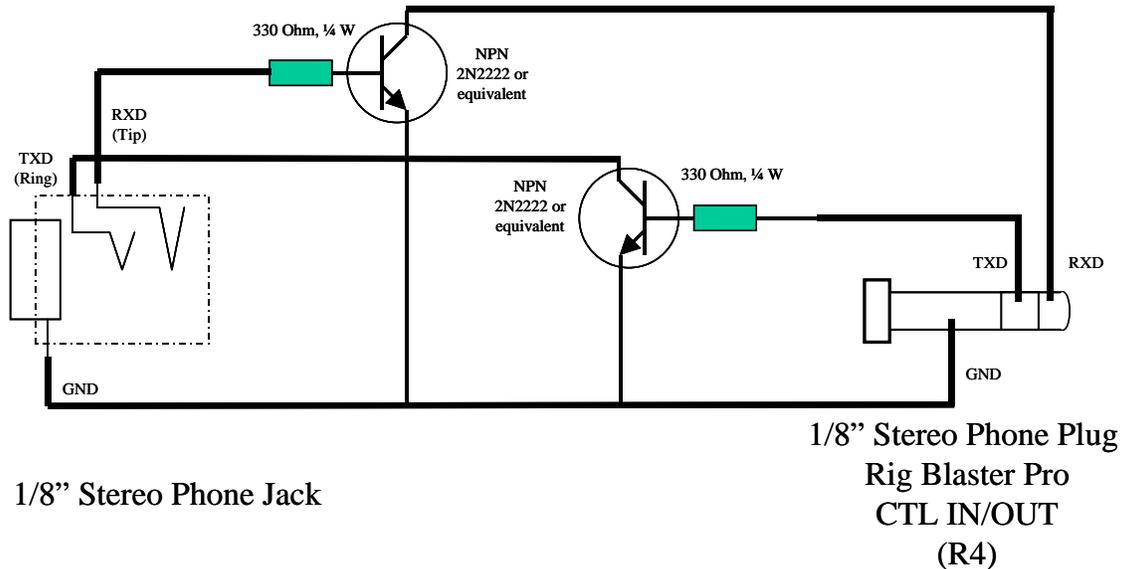


Figure 1. In-line Adapter Cable Containing Transistor Logic Inverters and Resistors

Figure 2 shows the schematic layout for the logic level inverter cable.

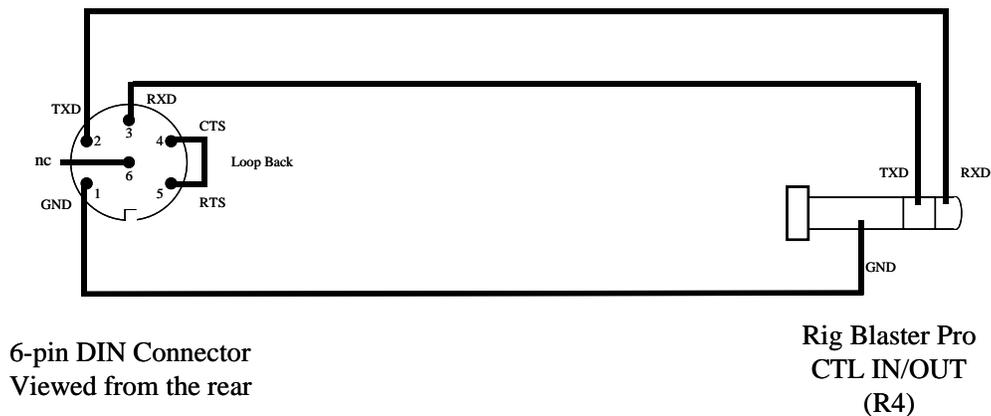


Ring is wired to ring and tip to tip with logic level conversion in-between

Figure 2. Schematic of the In-line Inverter Cable

### TS-450S Interface Cable

A cable is still necessary to connect from this inverter cable assembly to the TS-450S DIN connector. The cable is already shown correctly in the *RIGblaster Pro™* documentation but is redrawn in Figure 3 for completeness. The cable is made from another 1/8" stereo phone cable cut to length (as needed) and then connected to a full sized, 6-pin, male pin, DIN type connector. This connector and cable were purchased from a local supply house. There is nothing special about the cable assembly; use good quality shielded cable and cut the assembly to the required length for your situation. In the previous photo shown, this cable is shown attached to the inverting cable adapter and has the label *TS-450 CNTRL* wrapped around the plug.



**Figure 3. Cable Assembly to Connect to the Kenwood TS-450S ACC-1 DIN Connector for Rig Control**

### Pull-up Resistor Addition

The last item needed is to add the pull-up resistor inside the *RIGblaster Pro™* chassis. Figure 4 shows the location of the 330 Ohm,  $\frac{1}{4}$  W pull up resistor. It attaches from one end of the R28 resistor to the +5VDC output regulator lead of U6. Static protection measures should be taken to prevent damage to the circuit board's electronics. Alternately, two small clip leads as shown in Figure 5 could be used to attach to the R28 resistor and +5VDC lead to avoid having to solder the connection. If you do solder, use only the amount of heat necessary to create a solid connection to avoid heat damage to the board or components. The use of this pull-up resistor is in parallel with a 5 meg-Ohm resistor internal to the level converting IC. It will have no affect on its operation when regular TTL circuits are used to interface to the *RIGblaster Pro™*, thus it can be left installed for other radio interfacing as well.



Note: The resistor added (upper most resistor whose image is just below the J18 silkscreen letters in the photo) attaches to the +5VDC regulator (U6) lead and to one end of R28.

**Figure 4. Added Pull-up Resistor, 330 Ohm,  $\frac{1}{4}$  Watt**



Note: The resistor is shown exposed prior to the heat-shrink tubing being added. The clip leads attach to the two same points as shown in Figure 4 above.

**Figure 5. Alternate Way of Adding the Pull-up Resistor to Avoid Soldering Inside the Unit**

This completes the discussion of the TS-450S interface to the *RIGblaster Pro*<sup>™</sup>. If you have any questions or comments, please contact me at [k5pa@arrl.net](mailto:k5pa@arrl.net).

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