

Installing a Kenwood TS-520 Noise Blanker Board

X54-1080-10 into a Heathkit SB-303 Receiver

THOROUGHLY read this document BEFORE you attempt to install the Kenwood TS-520 NB Unit board (X54-1080-10) in YOUR Heathkit SB-303 receiver!! Read the disclaimer at the end of this document!!

The Heathkit SB-303 was not designed with a noise limiter. This made copying signals quite difficult when power line, hair dryer, or other pulsating type arcing noise is heard in your SB-303 receiver. Fortunately there is a fix for most of this type noise problem by installing a Kenwood TS-520 Noise Blanker board in your Heathkit SB-303 receiver. The Kenwood TS-520 model transceivers have the same 3.395Mhz IF frequency that the Heathkit SB-303 has.

The Kenwood TS-520 NB Unit board is connected between the output of the SB-303 "Mixer" PC board (part number 85-351-2) located directly behind the PRESELECTOR variable capacitor, and the MODE filter select wafer switch MS-1F located below the chassis, through a length of RG-174 coax cable. This is the "wide spectrum" of the receiver, just prior to the crystal filters. Noise Blankers must operate in this part of the receiver!!

The NB Unit board, when installed and connected, will be controlled (enabled/disabled) by rewired RF Gain control Push/Pull switch, replacing the original ¼" mono headphone socket with a "switched" headphone socket, and rerouting audio wiring. The original SPEAKER audio will be controlled, turned ON/OFF, by a replacement "switched" ¼" mono headphone socket. You can find them on eBay or from parts radios such as the HW-100, HW-101, and SB-100 lines of transceiver's "headphone" socket.

The ideal location to mount the Kenwood TS-520 NB Unit board is, with the SB-303 upright and front panel facing the user, on the "left" inside side panel between the side panel and the HF/VHF1/VHF2 switch shaft. The NB Unit board is mounted so the HF/VHF1/VHF2 switch shaft does not block the adjustment of the NB Unit's transformers T1 thru T5.

What parts are needed to add a Kenwood TS-520 NB Unit to the SB-303 receiver?

1. Approximately 1 foot of new RG-174 coax cable
2. A new RCA male plug
3. Four 3/8" long female 6-32 thread metal stand offs.
4. Eight 3/16" long 6-32 thread flat or Philips head screws
5. A known working Kenwood NB Unit X54-1080-10 board
6. A switched ¼" mono headphone socket (can be found on eBay or from Heathkit parts chassis)
7. The SB-303 complete assembly manual. I recommend this as the assembly manual contains the complete schematic, PC board and

component Xray views, troubleshooting tips, wiring pictorials, and alignment steps. Most abbreviated manuals found on the web do not contain these necessary pages so don't be a cheap skate, buy the manual if you don't have it!!!

8. A set of non-conductive TV/Radio alignment tools. Do NOT use metal screw drivers or hex Allen wrenches!!! Again, if you don't have these, buy them.
9. A spool of 20 gauge solid copper hookup wire. Stranded wire will work but solid copper wire works best when making mechanical/electrical connections. "NTE PARTS" sell a 25 foot spool of RED insulated solid copper wire for \$5.
10. Small diameter heat shrink tubing
11. Make absolutely sure your SB-303 is working PROPERLY before you attempt to install the TS-520 NB Unit in your SB-303!!!

Now that you have all the required items and you have ensured your SB-303 is operating properly in accordance with the Heathkit manual, you're ready to install the TS-520 NB Unit board in the SB-303 receiver.

First you will need a drilling template to mark the location of the NB Unit's mounting holes. I used a piece of 2 layer cardboard. Do not use the single layer stuff.

Next, lay the NB unit board, foil side down, onto the cardboard and press the board firmly against the cardboard so the foil side of the board rest "flush" with the cardboard surface.

Next, draw the outline of the NB Unit board, paying close attention to make the outline drawing as accurate as possible to the actual board's measurements!!

Next, draw the mounting holes, again, be as accurate as possible. There is very little, if any, leeway when scribing and drilling the board's mounting holes.

Next, cut out the board's outline and mounting hole then position the board's template on the left outside side panel. Pay attention to the templates location so when the board is mounted on the inside left side panel, the board's transformers T1 thru T5 are NOT blocked by the HF/VHF1/VHF2 switch shaft!!! Take your time with this step, you do not want the NB Unit board's T1 thru T5 transformers to be blocked by the switch shaft!!!

Next, once the template is oriented properly on the outside of the side panel, secure the template with tape to the left outside side panel. I used duct tape, it holds the template rather well against the side panel. The template must NOT move when scribing the mounting holes on the side panel!!!

Using a punch, make as deep of a mark to identify the exact center of each mounting holes. This must be as accurate as possible since, as I said before, there is very little, if any, leeway in drilling the holes. The

drill bit must NOT walk out of the center of the scribed mounting hole when drilling the holes!!!

Once the mounting holes have been drilled, temporarily mount the board on the inside left side panel, checking that transformers T1 thru T5 are not blocked by the switch shaft.

Remove the board and lay it aside, it will be mounted once all the wiring changes have been completed.

Looking behind the right side of the front panel, you will see the RF gain control and its Push/Pull switch assembly. There are 2 wires connected to the "Push/Pull" switch, one is a WHITE wire and the other is DARK BLUE wire. The DARK BLUE wire connects directly to the rear panel's SPEAKER socket and the WHITE wire connects directly to the AUD OUT terminal on the top of the PC board back plane.

Look on the PC board back plane, you will find a terminal labeled "AUD OUT". There are 2 WHITE wires connected to this terminal, one connects directly to the Push/Pull switch on the RF Gain control and the other WHITE wire connects directly to the rear panel "ANTI-VOX" socket (see the main schematic for details). You have to determine which WHITE wire goes to the ANTI-VOX socket. Look closely at the wiring harness as the WHITE wires leave the back plan AUD-OUT terminal. You will see both small WHITE wires, one goes along the

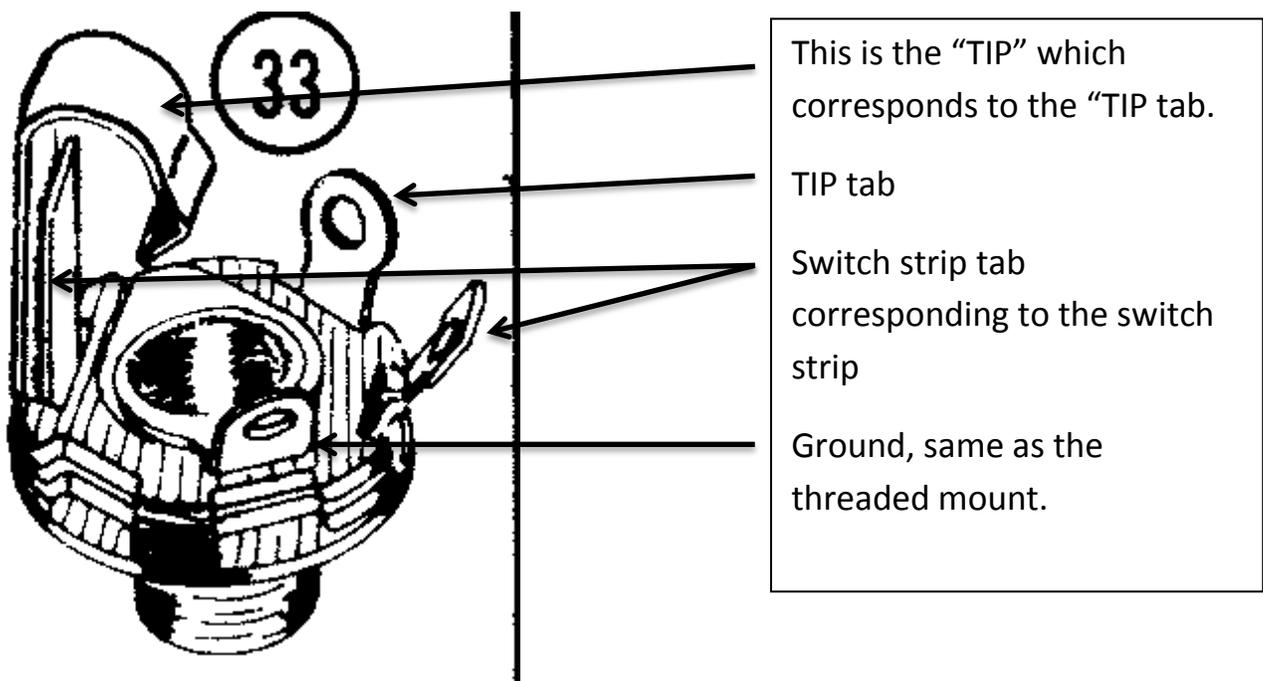
wiring harness towards the rear of the receiver, that's the ANTI-VOX WHITE wire. The other WHITE wire goes along the wiring harness towards and down to the hole in the chassis directly behind the crystal filters, to wiring below the chassis. That WHITE wire connects to the Push/Pull RF Gain control switch. Cut the WHITE wire from the AUD-OUT back plan terminal that goes to the RF Gain control Push/Pull switch. Strip back a small amount of insulation from the White wire. Using an OHM meter, connect the OHM meter between the WHITE wire and the DARK BLUE wire that's connected to the rear panel's SPEAKER socket. Push the RF Gain control switch IN, the OHM meter should show "infinity", Pull the switch OUT and the OHM meter should show zero ohms. If this is what you see then you have selected the correct WHITE wire from the AUD-OUT terminal. If not then you picked the wrong WHITE wire, swap the wires and repeat the OHM meter test, you should now see INFINITY with the switch pushed IN and zero ohms with the switch pulled OUT. This check verifies you have the correct WHITE AUD-OUT wire. This WHITE wire will be connected to the NB Unit's "NBS" terminal later.

Now, locate the DARK BLUE wire on the rear panel "SPEAKER" socket. Disconnect that DARK BLUE wire from the "SPEAKER" terminal and connect it to an adjacent GROUND lug, one of the RCA socket ground tabs will do fine, then solder the wire to the GROUND lug.

Look at the rear panel's headphone socket and you will see a single WHITE wire connected to the socket. Disconnect that wire and fold it back and cover the end with heat shrink tubing to prevent the wire

from coming in contact with any terminals/grounds. This wire will not be used.

Remove the old headphone socket. Keep it as a spare in your junk box. Install the replacement ¼" switched mono socket in place of the non-switched headphone socket with the 3 tabs closest to the bottom of the panel. The picture below shows a typical "switch" ¼" mono headphone socket. Note the 3 tabs. Use your OHM meter to verify each tab as the picture shows. I have found some "GROUND" tabs are on the opposite side so make sure you use your OHM meter to verify each tab.



Note the large "U" shape bar, that's the "TIP" bar that connects to the TIP tab. The short straight "strip" is the "Switch Strip" that connects to the "Switch tab". The other tab is ground. This socket's switch replaces the front panel "Push/Pull" RF gain control switch. When properly

wired, plugging a headphone into the socket cuts the speaker OFF but audio is heard in the headphone. Remove the plug and audio is again heard in the speaker.

Cut a length of shielded cable, I used the cheap shielded cables with RCA plugs on each end that comes with DVR/DVD/VCR players/recorders. I cut the RCA plugs off, strip one end, then connect the “shield” to the socket’s “GROUND” tab and the center wire to the socket’s “TIP” tab. Route the shielded cable up along the rear panel through the square hole, along the top of the rear panel and along the wiring harness to the back plan “AUD OUT and AUD GND” terminals. Connect the center wire to the AUD OUT terminal and the shield to the AUD GND terminal and solder each wire. Use just enough heat to do the job, too much heat can overheat the plastic and deform the back plan!!!

Go back to the new HEADPHONE socket, connect and solder a length of hookup wire from the socket’s “Switch strip tab” to and solder the wire to the rear panel “SPEAKER” socket. Make sure you DO NOT connect the hook up wire to the SPEAKER socket’s “GROUND” tab.

Remember the WHITE wire you disconnected from the Back plan “AUD OUT” terminal? Connect and solder a length of solid copper hook up wire to this WHITE wire. Put a length of heat shrink tubing over the solder connection, heat the tubing so it shrinks and covers the connection. Route the other end of the wire along the wiring harness towards the left side of the receiver then forward along the side panel

to the NB Unit board then connect and solder the wire to the NB Unit's "NBS" terminal. Again, use just enough heat to perform the solder connection.

Remove the original RG-174 coax cable from the Mixer board's OUTPUT socket. Disconnect the other end of that coax cable from the MODE switch MS-1F switch wafer below the chassis. Important, make note where the center and shield wires are connected to the MS-1F MODE switch filter switch wafer!!! You will be connecting the other end of the new RG-174 coax cable to MS-1F switch wafer!!!

Make up 2 separate lengths of RG-174 coax cable. One will be approximately 3 inches long. It should be long enough, without any stress, to connect the Mixer OUTPUT socket to the NB Unit board's "NB IN" and NB IN GND terminals. Strip one end and connect a new RCA socket to the cable. Strip the other end and connect the Center to the NB Unit's "NB IN" terminal and the shield to the NB IN GND terminal.

Strip the end of the second RG-174 coax cable then connect the center to the NB OUT terminal and the shield to the NB OUT GND terminal.

Next, route the RG-174 cable down through the hole behind the LMO then connect and solder the Center and Shield to the appropriate MS-1f wafer switch terminals below the chassis you were told to
REMEMBER!!!

Connect and solder a length of solid copper hook up wire from the NB Unit' "B" terminal to the SB-303 FUNCTION switch "ORANGE" wire, this is where the NB Unit power source comes from, +15VDC. No zener diodes or resistor voltage dividers needed. The NB Unit board is designed to operate from +15VDC.

Now thoroughly check all of your work to be sure there are no shorts, no poor soldering, and no loose or otherwise broken wires, excluding the WHITE wire removed from the original ¼" mono headphone socket.

If all is good, connect a speaker to the rear panel SPEAKER socket. Plug the receiver's power cable into the rear panel power connector, connect an antenna to the HF antenna socket on the rear panel, and plug the receiver into the 120VAC wall outlet. Plug the LMO load resistor plug into the rear panel "LMO OUT" socket. If you don't have one, you can make one using an RCA plug and a 50 ohm ¼ watt resistor.

Power up the SB-303 and you should hear audio from the speaker and signals when tuning around the band. If you do not hear audio in the speaker, check the speaker and it's cable, it may be bad. If you still do not hear audio, recheck the headphone socket and SPEAKER socket wiring, you have made a mistake in the wiring and didn't see the mistake when checking ALL the wiring. If you hear audio in the speaker then continue.

Turn to the SB-303 manual page 112 "PRELIMINARY ADJUSTMENTS". A DC volt meter connected between the FUNCTION switch ORANGE wire and ground is required for the +15VDC adjustment. The same DC volt meter connected to the RF AMP SWITCH BOARD's "AGC terminal" is required for the +3.5VDC adjustment. Don't assume because you did this adjustment last week that you don't have to do this. Like I always say, NEVER ASSUME ANYTHING, ALWAYS CHECK TO BE SURE!!!! Check and if necessary, perform these adjustments NOW.

Next, either disconnect the antenna from the receiver or set the CONVERTER switch from HF to either VHF1 or VHF2, it doesn't matter. Set the RF ATTEN control fully CW.

Set the FUNCTION switch to either 25Khz or 100Khz, it doesn't matter, and tune in the middle of the selected band for a beat note at either 25Khz or 100Khz interval. Adjust the PRESELECTOR and LMO main tuning knob for a peak S meter indication.

Without touching any other control(s), adjust NB Unit transformers T1, T2, T3, T4, and T5, in that order, for a peak S meter indication.

Adjust the 3 IF transformers T901, T902, and T903 on the IF AUDIO CIRCUIT BOARD for a peak S meter indication.

Make a label that says

NB ON PUSH

NB OFF PULL

and affix it to the front panel just below the RF gain control.

The NB Unit will only affect “pulse type noises” such as automotive ignition noise, some older hair dryer arcing noise, and power line arcing noise. The NB Unit will NOT affect atmospheric noise/lightning crashes, corona noise, and other non-pulsing type noises such as noise from wired/wireless computers and Internet routers.

DISCLAIMER:

If any of the above steps appear to be beyond your capabilities including electronic knowledge, mechanical and wiring abilities, ability to read and understand a schematic, including using proper safety precautions working around any AC and DC voltages, do NOT repeat DO NOT attempt to install the Kenwood TS-520 NB Unit board in your Heathkit SB-303 receiver. I have made every attempt to provide as accurate as possible, simple instructions to install the Kenwood TS-520 NB Unit (X54-1080-10) board in an SB-303. However, I will not accept responsibility for nor will I be held accountable for any mistakes/errors YOU make that renders your SB-303 receiver inoperable prior to, during, and after installing the Kenwood TS-520 NB Unit (X54-1080-10) board into your Heathkit SB-303 receiver. I'm sorry but I do NOT perform installation nor do I provide parts for the installation of the Kenwood TS-520 NB Unit (X54-1080-10) board in your Heathkit SB-303 receiver so don't ask. It is your responsibility to obtain any/all parts/components and user/assembly manuals required to properly perform the installation of the Kenwood TS-520 NB Unit (X54-1080-10) board in your Heathkit SB-303 receiver! It's also YOUR responsibility to follow proper safety precautions when working in and around all AC and DC voltages.