

## **INSTRUCTIONS FOR HX-50 ZBZ INSTALLATION**

### Purpose:

To permit rapid zero beating of the HX-50 transmitter frequency with a received signal without disturbing any operating controls other than the VFO tuning.

### Operation:

Connect a switch to terminal #6 or #8 and ground. Upon closing the switch contacts, the transmitter is automatically placed in "calibrate" without the necessity of operating any other control. After zero beating, releasing the switch places the transmitter on frequency ready to operate.

When the relay is energized: (a) One pair of contacts opens the cathode return of the speech amplifier tube thus disabling the speech and VOX amplifier circuits (b) a second pair of contacts shunts a capacitor from one side of the balanced modulator to ground which permits a greater signal to appear on the grid of the first mixer (c) a third set of contacts decreases the cutoff bias to the RF driver stage to allow the output to leak through to the PA (d) a fourth set of contacts opens the VOX trip relay control coil circuit and prevents accidental transmit function during zero beating operation.

### Installation instructions:

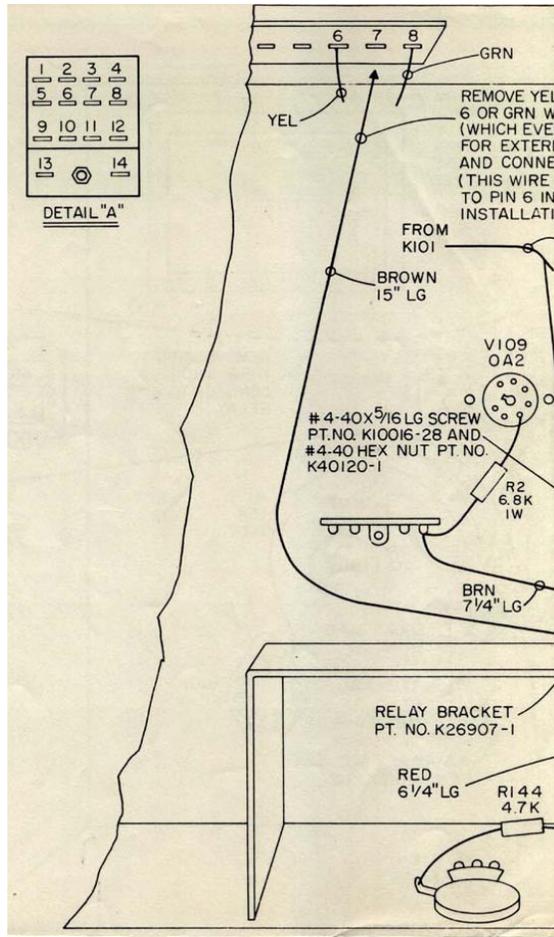
- 1-Remove resistor R-107 (1.5K, ½ w) from pin 4 of V101 (6C10) and ground.
- 2-Unsolder the GREY wire from relay K102 coil terminal and redress it to reach the ZBZ relay terminal #1 (see drawing)
- 3-Install R2 (6.2K 1 w) between pin #5 of V109 (OA2) and unused lug of terminal strip (see drawing)
- 4-Mount the ZBZ relay to the bracket. Remove the cable clamp holding the shielded mic cable. Mount the relay in the hole where the cable clamp was located. Dress the mic cable under the relay.
- 5-Solder the 1.5K 1/2 w resistor and the 10 pf capacitor to the relay terminals. (see drawing)
- 6-Solder the orange wire, the brown wire and the two red wires to the relay. (see drawing)
- 7-solder the short bare wire in place (see drawing).
- 8-Check carrier balance and adjust if necessary.

9-Connect the ZBZ operating switch (not supplied) between TB101 terminal #6 or #8 and ground.

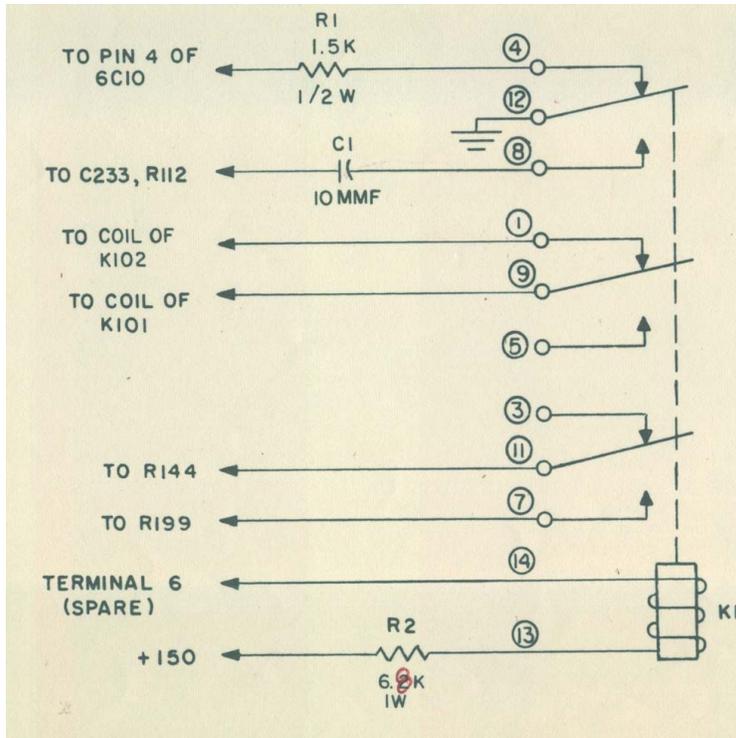
(NOTE: On the HX-50A the ZBZ switch was incorporated into a potentiometer installed on the front panel beneath the bandswitch. The potentiometer varied the strength of the signal used for zero beating. Details are included elsewhere in the modifications pages-ed)

1	2	3	4
5	6	7	8
9	10	11	12
13	⊙	14	

DETAIL "A"







## HAMMARLUND BULLETIN DETAILING SEVERAL CHANGES IN HX-50 CIRCUITRY-part 1

1-R213 is changed to 1K ½ W.

2-R-116 is changed to 220 ohm 1/2W

3-R-132 has been deleted

4-A 1.8K 1/2W resistor has been installed between pins 1 and 7 of V-105 (6AU6)

5-L-119 and C-211 have been deleted

6-A 20K 10W wirewound resistor has been installed in parallel with R-218

7-CR-111 has been deleted and replaced with an OA2 regulator tube (pin 7 to ground, pins 1 and 5 to LO B+ side of R-218. CR-111 was a zener diode from terminal strip TB-9 to ground and R-218 was a 10K wirewound resistor from LO B+ to TB-9. The zener was prone to failure and was replaced by a second OA2 tube.

8-A trimmer capacitor (1.5-20 pf) has been installed from the junction of CR-101 and C-105 to ground.

(NOTE: In early radios there was no CR-111 and no R-218, and hence no regulation on the LO B+ feeding the low level stages. These changes may have been included in a

Hammarlund bulletin code 2 or 3. R-218 was a 10K 10W wirewound resistor to the junction of CR-111 from the LO B+. In my unit there are two 12K 10W resistors in parallel from the LO B+ to the newly installed OA2 tube (the one attached to the chassis with bolts rather than rivets). These resistors run very hot, suggesting that less than 6K total resistance is required...perhaps more like 5K or 4.7K.-ed)

## **HAMMARLUND BULLETIN DETAILING SEVERAL CHANGES IN HX-50 CIRCUITRY part 2**

(NOTE: several of these are also detailed in the Code 4 modifications described below-ed)

1-The RF tank shield has been modified to the new cut-down version to simplify installation of the 160M kit and lengthen life of the 6DQ5 final tube through better heat dissipation. The RF cover or cage has also been removed for these same reasons. (My unit has a perforated cage on 3 sides around the PA-is this what Hammarlund means by "cut down version"???-ed)

2-A relay adjust potentiometer, 1 meg, has been installed on the rear chassis to permit setting the relay pull-in/dropout points. Place the transmitter in VOX and vary the potentiometer end to end until the relays pull in. Back off the potentiometer until the relays open. Test and re-set until the proper points have been set. The potentiometer connects to the terminal strip adjacent to the original OA2 regulator tube. Counting the terminal numbers from the rear of the chassis (terminal 1), the potentiometer goes to terminals 2 and 5 on this strip.-ed)

3-L-107 has been changed from 2.2 uh to 2 uh to increase drive on 40M.

4-R-144 has been changed from 4.7K to 3.3K to increase the level of the calibrate signal.

5-R-179 has been deleted and replaced with wire.

6-L-114 and C-198 have been deleted

7-R-194 has been deleted to increase drive on 20M

## **HAMMARLUND BULLETIN DETAILING SEVERAL CHANGES IN HX-50 CIRCUITRY part 3**

1-To increase VOX sensitivity, install a 47K 1/2W resistor between C-110 and the junction of T-102 and R-113. C-110 connects to T-102 and pin #10 of the 6C10.

2-To reduce key clicks, install a 2 mfd capacitor between the junction of R-199 and R200 and ground. If an electrolytic capacitor is used, install with positive terminal to ground. (NOTE: this was the first crude attempt to alter the time constant of the keying

waveform; it was superceded by the modification noted below in the bulletin released in 1963 in which the 2 mfd capacitor is not used-ed)

## **HAMMARLUND HX-50 CODE 4 MODIFICATION KIT INSTALLATION**

This set of modifications must be done before the Code 5 modifications

1-Locate R153 (430K 1/2W in line with the center of the microphone connector and 1" down from the top of the chassis). Replace with a 1 meg variable resistor.

2-Locate coil L-107 (2.2 uh) on the bandswitch front wafer and replace with a 2.0 uh coil.

3-Locate R-144 (4.7K 1/2W between operations switch and ground lug on audio pot on front of chassis) and replace with a 3.3K 1/2W resistor.

4-Locate R142 (3.9K 1W between TB8 and the bias control) and add a 6.8K 1W in series (this is now referred to as R216). Run a 7" piece of brown wire from the junction of these two resistors to the normally open contact of the VOX relay K102 (this lug will now have two brown wires attached to it).

5-Locate L109 (.68 uh, on bandswitch front wafer) and replace with a .56 uh coil.

6-Locate R-116 (820 ohm 1/2 W) on the terminal board of the crystal mounting bracket. In some production runs there is an additional 820 ohm resistor in parallel with R116. If present, remove the second resistor.

7-Locate R179 (47 ohms 2W) on antenna changeover relay and remove it. Replace with a wire jumper.

8-Locate choke L114 (560 uh between pin 6 of V111 and nearby terminal board). Remove this and replace with a wire jumper.

9-Locate R194 (10K 1/2W in parallel with secondary of T-120, the 20M driver coil). Remove this resistor.

## **HAMMARLUND MODIFICATION INSTRUCTIONS-CW KEYING MAY, 1963**

1-Remove R-119 (1K) and C-114 from T-103 and ground the terminal of T-103 from which the parts were removed. Leave the other end of the resistor connected to the blocking bias tie point for now.

2-Unground pin #6 of the 6AW8A, V103 and install a 270 ohm resistor shunted by a .01 mfd disc capacitor from pin #6 to ground.

3-Remove R125 (10K 1/2W) from pin #7 of V104 (6BA7). Install a 10K 1/2W resistor between pin #7 of the 6BA7 tube and the block bias tie point where R119 was left connected. Remove R119 after the new resistor has been installed. Install a .01 mfd disc capacitor from the tie point to ground.

4-Remove R118 (330 ohm ½ W and C217 (2 mfd capacitor). In some early units the 2 mfd capacitor was not installed. If this is the case, after removing R118 add a jumper between the junction of R199 (1K) and R200 (82K) and the terminal on the tie strip where the 2 mfd capacitor would have been connected.

5-In the event that the CW VOX time is too short add a .22 mfd 400V capacitor across the CW VOX delay pot R149B. The delay will then be the RC product set by R149A/C147 plus R149B and the .22 mfd capacitor just added).

6-Setup: with the transmitter in VOX USB or LSB set the outer shaft of the delay control for the desired delay. Switch the transmitter to VOX CW mode and key the transmitter. Adjust the inner shaft of the delay control for the desired keying delay.

## **HX-50 CODE 5 MODIFICATION INSTRUCTIONS**

- 1-Locate R133 (470 ohm between pin 7 of V105 and ground) and replace with a 430 ohm choke.
- 2-Locate C193 (1000 pf feedthrough capacitor into antenna relay/neutralizing capacitor compartment) and remove. Install a new buss wire between T21 and C189. Connect one end of a 500 pf disc ceramic to the buss wire as it enters the compartment and the other end to ground.
- 3-Locate R172 (15K 2W on terminal board TB3 near V108) and parallel with a 10K 2W resistor now called R220.
- 4-Locate the blue wire between pin 6 of V107 and the coil of relay K102 and replace with a 7K 5W resistor now called R219
- 5-Locate R142 (3900 1W near power transformer between TB8 and the bias control) and parallel with a 1K 1W resistor now called R217.
- 6-Locate R212 (180 ohm 1/2W on TB2 near V108) and replace with a 22 ohm 1/2W resistor.
- 7-Locate R213 (1.5K 1/2W between pin 8 of V107 and ground) and replace with a 680 ohm 1/2 W. Measure the idle current and change the 680 ohm with 1K if the idle current is over 3ma.
- 8-Locate R214 (91K 2W on TB2 near V108) and replace with 50K 10W or 2x 25K 5W in series.
- 9-Locate R174 (1K 1W) and replace with 470 ohm 2W.
- 10-Locate the blue wire between L113 (2.5 mh) and the bias source (junction R172, R220, R177) on TB3. Remove this blue wire and replace it with a 15" length of blue wire from L113 to the arm of R143 (the bias adjust pot). Remove the jumper installed between the arm of the pot and the end of the pot which has the blue wire running to the bias source tie point on TB3.
- 11-Mount a single lug tie strip so the lug is near pin 5 of V109. This tie strip is now TB9.
- 12-Disconnect the three red wires from pin 5 of V109 and connect them to the new TB9.
- 13-Locate C162C and disconnect the two white/red wires. Re-route the one which comes from TB7 (junction of R141 and R157) and connect it to pin 5 of V109. Cut the other wire close to where it enters the cable bundle.
- 14-Locate R156 (4.7 ohm 2W) on TB2 near V108 and remove it.

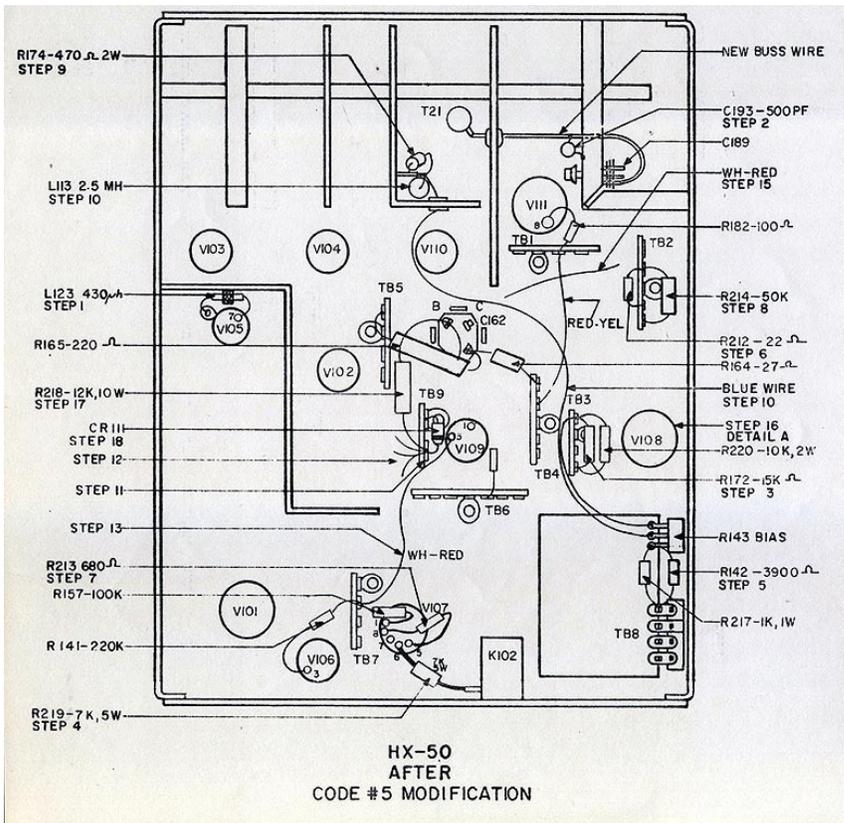
15-Remove the white/red wire from TB2 and cut it back to where it enters the cable bundle.

16-Add R218 (12K 10W) from C162B to TB9. Add zener (value unknown) from TB9 to ground (cathode to TB9).

(NOTE: This last modification...adding the zener...can be omitted if the second OA2 tube is installed in its place).

See the diagram on the next page for details of installation.

**After the above modifications it will be necessary to re-set the bias control and re-neutralize the final.**



## HAMMARLUND HX-50 SPEECH AMP AND VOX MODS

If your set has been stamped with a "1" or higher in a circle located near the serial number then these modifications have been done at the factory. The modifications improve speech amplifier, VOX and balanced modulator performance. Interaction between the audio level control and VOX sensitivity is eliminated with this modification.

1-Remove the lead from the mic connector and add R208 (39K 1/2W) between the center contact and unused lug of the terminal strip located between TB101 and J103 (key jack). Reconnect the hot lead which formerly went to the mic connector to the terminal end of R208.

2-Remove C101 (100 mfd) connected between pin 11 of V101 and ground and connect it between the terminal at R208 (above) and ground.

3-Remove C216 (.22 mfd) connected between

4-Change R102 ( located on pin 11 of V101-6C10) from 100K to 1 meg

5-Change R103 (located on pin 3 of V101-6C10) from 3.9K to 1K

6-Disconnect the tube socket end of the lead from the AF level control R106 (connected to pin 9 of V101-6C10) . Completely remove C103 from the terminal strip (connected to the hot side of the AF level control) and pin 2 of the 6C10. Add R209, 470K between pin 9 of V101-6C10 and both pin 6 of V101 and ground. Connect a .005 mfd disc ceramic (now becomes C103) between pin 2 of V101 and pin 9 of V101.

7-Remove C218 (5 mfd 6V, located between pin 1 of V106 and ground). Remove R140 (1.5K located between pin 1 of V106 and ground).

8-Change R107 from 3.9K to 1.5K by using the resistor removed in step #7 above. R107 is located between pin 4 of V101 and ground.

9-Remove C106 (.22 mfd, between two terminal strips near V101 and V106)

10-Remove R108 (47K, wired on terminal strip under V101)

11-Change R101 from 220K to 120K and connect between pin 10 of V101 and the B+ lug of the terminal strip (near V101-has red wire attached to it)

12-Remove R207 (47K 1/2W) if it was installed in a previous modification or at the factory.

13-Wire C110 between pin 10 of V101 and the lug of the terminal strip to which the hot side of the AF level pot is connected (white wire with red tracer). It may be necessary to add wire to one lead.

14-Replace R113 (47K 1/2W) with capacitor C234 (.002 mfd disc between ground and the center tap of T102).

15-Add matching transformer T101 in holes located between the terminal strip and chassis as shown in the diagram below, red and blue leads facing toward the terminal strip. Blue lead connects to ground. Red lead connects to the empty lug of the terminal strip. Yellow connects to ground. Green connects to the center tap of T102 secondary.

16-Re-dress the shielded lead (white-blue tracer connected to arm of AF level control) to facilitate connection of the center conductor to the same lug of the terminal strip as the red lead of transformer T101. Ground the shield to the ground lug of the terminal strip.

17-Remove R204 (100K 1/2W) and CR109 (zener diode) from the lug of the terminal strip (see attached pictorial diagram). Connect a yellow lead 9.5" long between this lug and the junction of R199 and R200 (this point is on a terminal strip between V109 and C175, extreme right lug closest to rear of chassis-see pictorial diagram). Remove completely both of the above noted components. (NOTE: These two parts are not shown on the original schematic in the manual but are shown on the unmodified diagram for this modification which is not available).

18-Connect a red wire 4.9" long from pin #1 of V106 to S101B (function switch-wafer nearest the front panel-red wire which is connected to R203, 100K 1/2W on operation switch S104 rear. This resistor R203 is not shown on the original schematic diagram.)

19-Connect C235, a .22 mfd 400V capacitor from pin #1 of V106 to ground (use the capacitor C106 previously removed in step 9)

20-Add a 470K 1/2W resistor across R153 (910K 1/2W to make R153 equal to 330K. (R153 is located on the terminal strip between V109 and C175, lugs 3 and 6 counting left to right).

21-Remove the orange-white tracer lead from the rear pot R149A of the VOX/CW Delay control and connect it to the wiper arm of R149B, wiper arm of the front pot. Remove the jumper between R149A and R149B and replace with R210, 470K 1/2W.

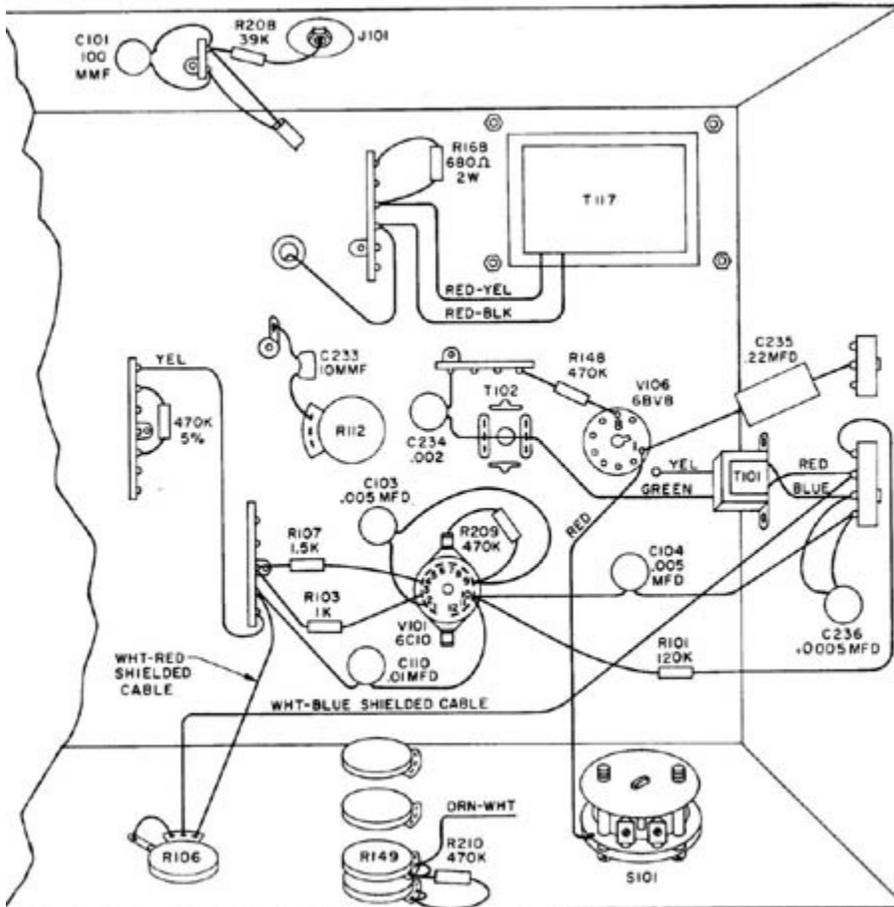
22-Change R148 (1 meg 1/2W) to 470K (R148 is located between pin 8 of V106 and terminal strip adjacent to V107).

23-Disconnect the short shielded lead from pin #11 of V101 and re-dress it to reach the lug of the terminal strip which is connected to the junction of C110 and the hot side of the AF level control (white-red tracer shielded lead). It may be necessary to add a short piece of wire to this lead.

24-Add a .0005 mfd capacitor between ground and the lug to which C104 is terminated.

25-Inspect the power transformer secondary winding connections. If the red-yellow tracer wire is connected to choke L112 and the red-black tracer wire is connected to the 680 ohm resistor these wires should be reversed so that the red-yellow tracer wire is connected to the resistor and the red-black to the choke.

After modifications have been completed the balanced modulator must be readjusted.



## **HX-50 RELAY TRIP MODIFICATION**

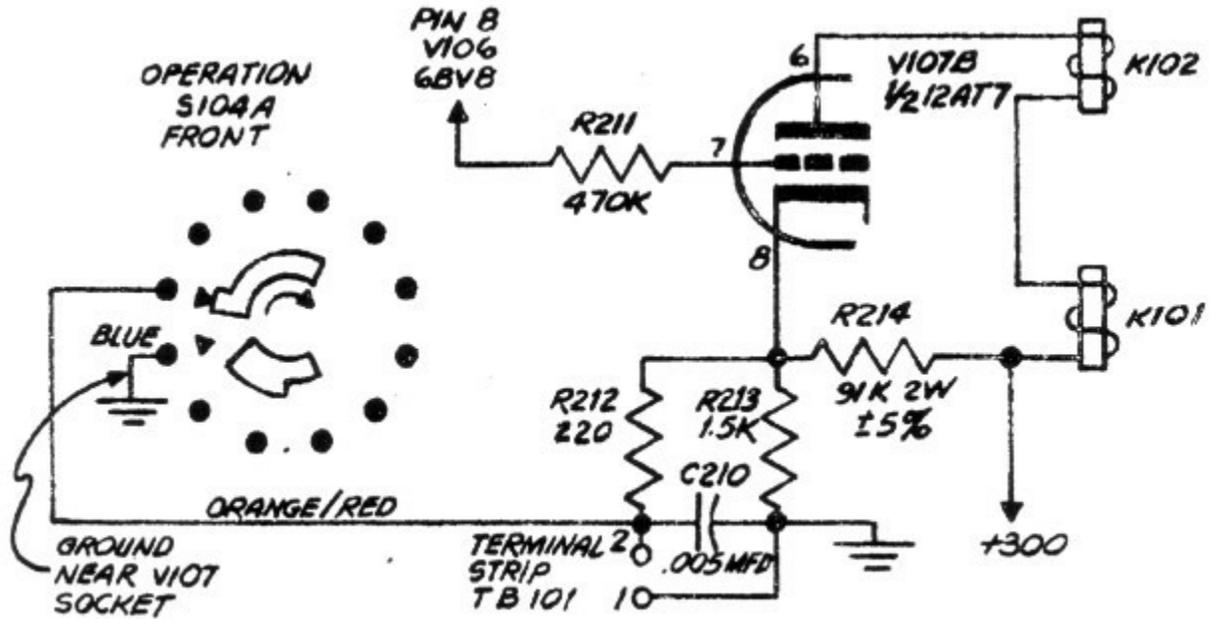
The purpose of this modification is to eliminate the tendency of the VOX relays to “hang up”. The idling current through the relays is reduced to a value considerably below the drop-out point to which the relays have been adjusted. Additionally, this modification will permit operating a push-to-talk switch against ground.

- 1-Unsolder the ground wire and capacitor from the antenna relay coil terminal and remove both.
- 2-Feed a 5.5” length of insulated wire through the grommet and solder one end to the relay coil.
- 3-Remove R151, 18K 2W from the terminal strip adjacent to the output shield compartment.
- 4-Remove R152, 8.2K 2W resistor from the terminal strip and replace with a 91K 2W resistor.
- 5-Solder the other end of the wire installed in step #2 to the terminal strip lug to which the red wire is connected.
- 6-Install a 220 ohm 1/2W resistor between the lug to which the orange/white lead is connected and the lug to which the yellow/red lead is connected.
- 7-Remove both blue leads and capacitor C161, a .01 mfd from pin #8 of V107B.
- 8-Remove the orange/white lead and C149, a .22 mfd from pin #6 of V107B and solder the wire to pin #8 of V107B.
- 9-Install a 1.5K 1/2W resistor from pin #8 of V107B to ground.
- 10-Locate the blue lead which connects to the VOX relay K102 and solder it to pin #6 of V107B.
- 11-Solder the other blue lead to ground near V107B.
- 12-Remove the red/yellow lead and C147, .22 mfd, from pin #7 of V107B. Lengthen the lead of the capacitor and connect to pin #8 of V106. Cut the red/yellow lead back to the cable run.
- 13-Remove the jumper between pin #8 of V106 and pin #7 of V107B and install a 470K resistor in its place.
- 14-Replace R148, 470K 1/2W with a 1 meg resistor.

15-Remove the red/yellow lead from terminal 2 of TB101, cut it short to the cable run and install a 2.5" wire between terminal 2 of TB101 and the yellow/red wire on the terminal strip at junction of the yellow/red wire and the 220 ohm resistor.

16-Remove C210, .005 mfd disc and R154, a 10 meg 1/2W from terminal 1 of TB101 and other lug.

17-Ground terminal 1 of TB101.



**PARTS REQUIRED FOR MODIFICATION**