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## TS-950 Mods

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IZ5CCV

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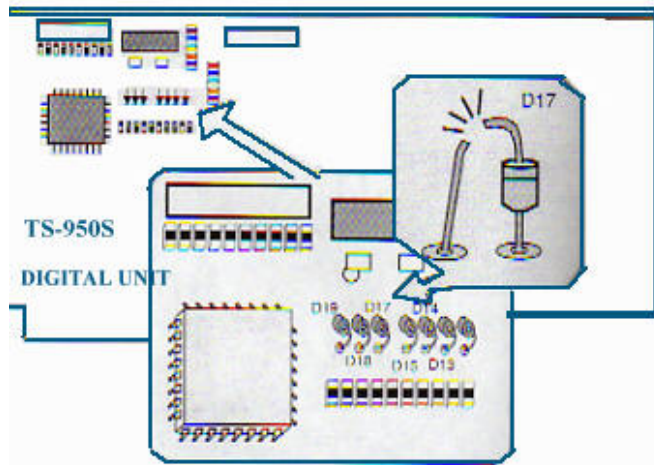
## Implementation of the K6XX QSK Waveform Mod in the TS-950SD

### TS-950 SO2 Adjust

### Using Sub receiver to Improve TS-950 Noise Blanker

## TS-950SD general coverage transmit mod

1. Remove power and ant.
2. Remove top and bottom covers.
3. Locate the digital unit.
4. Cut diode d-17
5. Reassemble radio.
6. Reset cpu.



## Kenwood TS-950 Power On Functions

Please notice that all functions only work if you switch off radio first.

Please push the named buttons to start function when switching on the radio:

**SUB** : SUB receiver capable of scanning, to SUB-scan push and hold the SUB-key and press than the scan key

**ENT** : Set up ch. 90-99 as amateur band vfos 160-10 m band possible. each memory vfo will accept direct frequency entry. like ICOM band stack memory)

**5+M-VFO** : set up ch.80-89 to accept any memory data

**RX/A** : Turn ON/OFF SUB receiver marker on SM 230 Monitor in 100 kHz/250kHz and 25kHz sweep mode.

**IC+COMP** : stop transmit if Ic exceeds 1,7 A. Power output limited to 10 Watt

**8.83 + RIT** : Both 8.83 MHz and 455 kHz IF Filters are selectable on transmit. Each memory channel is also capable of storing this setting.

**Memory protect**: Cutting D 129 on control unit protects memory contents from beeing erased.

**Write protect** : Cutting D 18 on Control Unit write protects all memory channels.

from Hanno DG8JZ

## Kenwood TS-950-SDX Allows sub-rcvr to be on different band than Main receiver

Allows sub-rcvr to be on different band than Main receiver.

This is a Power On function mod.

Start with radio turned off.

Hold down buttons SUB, M/S, RX/SUB while turning on the power ON. Now you can listen to 15M on sub-rcvr with Main rcvr on 20M. or any other band or visa-versa. Both receivers will be in the same mode USB, LSB, CW etc.

73,

George, K5GH

## TS-950SD Speech processor noise

*Author: Trio-Kenwood Communication, inc.*

When the Processor-In control is set to some level below 10 dB of compression, a crackling noise can be induced on the transmit signal. The following modification will reduce the noise. After the modification has been performed, the noise can only be heard when the Processor-In control is set too low to be functional.

**Note:** This modification has already been performed on models starting with serial number 0120441.

Required parts:

Transistor (PNP)	(2SC2458Y)
4.7 ohm, 1/6 watt resistor	(RD14CB2C4R7J)
10 ohm chip resistor	(RK73FB2A100J)
39 ohm chip resistor	(RK73FB2A390J)
10 Kohm chip resistor	(RK73FB2A103J)

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).

Locate the Signal board on the bottom of the transceiver. This is the front right board of the 4 boards on the bottom of the transceiver.

Disconnect the 3 flex cables and remove the 6 mounting screws from the Signal board.

Carefully lift the board and rotate it toward the AF unit (front left board) to expose the foil side of the Signal board. Loosen the wire harness as necessary to rotate the board.

**The following will be performed on the foil side of the Signal board.**

Cut the foil between pin 3 of CN18 and chip resistor R229.

Desolder and remove R229.

Solder a 10 ohm chip resistor across the cut foil.

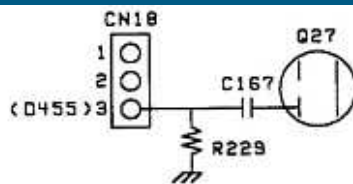
Solder a 39 ohm chip resistor in place of R229 (it will be slightly offset due to the installation of the 10 ohm resistor).

Solder a 4.7 ohm resistor to the collector of a 2SC2458(Y) transistor. Shorten the lead length to accommodate the following installation and insulate the leads with shrink tubing.

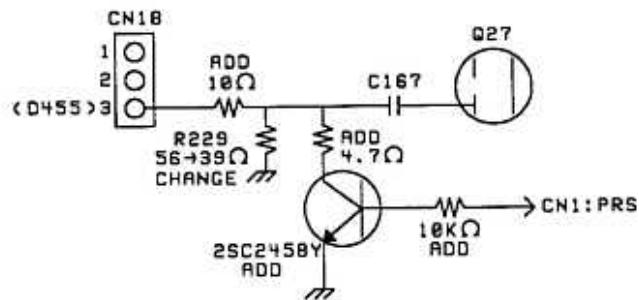
Solder the exposed end of the 4.7 ohm resistor to chip capacitor C167.

Solder the base and emitter leads as shown in the accompanying diagram.

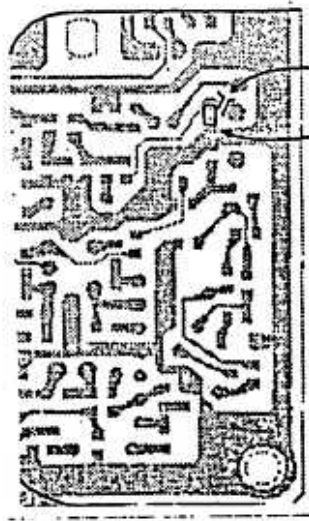
Solder a 10 Kohm resistor to the circuit as shown.



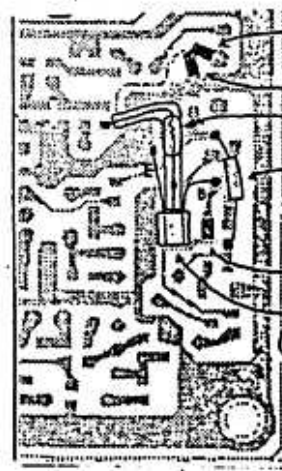
ORIGINAL



MODIFIED



CUT

REMOVE  
R229ADD 10 OHM  
INSTALL R229ADD 4.7 OHM  
W4ADD 10K OHM  
ADD 2SC2458Y

This modification is covered under the 1 year warranty.  
Time required to perform the modification is 1 hour or less

### TS-950SD N.B. Gate switching noise

*Trio-Kenwood Communication, inc.*

Service Bulletin no. 961 (11-1-1990)

Switching noise from the main band noise blanker circuit may be induced on the 15V line and pass through the AF amplifier to the speaker. The following modification will correct this condition.

**Note:** This modification has already been performed on models starting with serial number 104xxxx.

Required parts:

120 ohm, 1/8 watt resistor (RD14BB2B121J)  
100  $\mu$ F, 16 V electrolytic capacitor (CE04EW1C101M)

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).

Locate the AF board. This is the front left board of the 4 boards on the bottom of the transceiver.

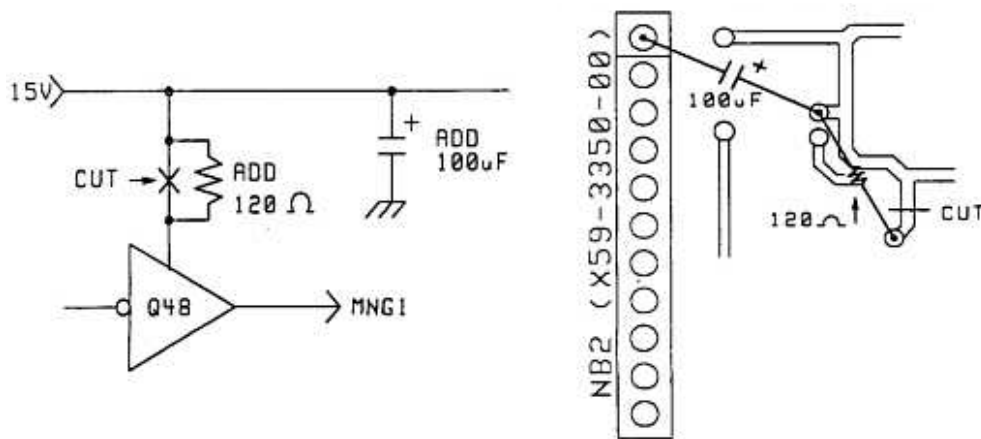
**This work will be done on the component side of the AF board.**

Cut the foil shown in the accompanying diagrams.

Add a 120 ohm resistor between the emitter of Q48 and the 15 V line.

Add a 100  $\mu$ F, 16 V capacitor between the 15 V line and ground.

Reassemble the transceiver.



This modification is covered under the 1 year warranty.  
Time required to perform the modification is ½ hour.

### TS-950SD Early protection with TL-922A

*Trio-Kenwood Communication, inc.*

Service Bulletin no. 962 (17-1-1990)

The TS-950SD RX to TX switching time in semi break-in is approximately 10 mS. At the key down, the transceiver momentarily sees an open circuit because the linear's keying relay has not engaged. As a result, the transceiver's protection circuit turns on, causing the output power to be reduced. The following modification will make the RX to RX switching time, in semi-break-in, approximately 30 mS. This modification does not affect full break-in switching. Increasing the switching time to 30 mS may restrict certain long distance high speed communications.

Required parts:

Digital transistor (QTY 2)	(DTC124ES)
100 Kohm, ¼ resistor	(RD14BB2E104J)
2.2 $\mu$ F, 50 V electrolytic capacitor	(CE04EW1H2R2M)

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).

Remove the top screw from each side of the front panel assembly.

Loosen the bottom screw on each side of the front panel assembly.

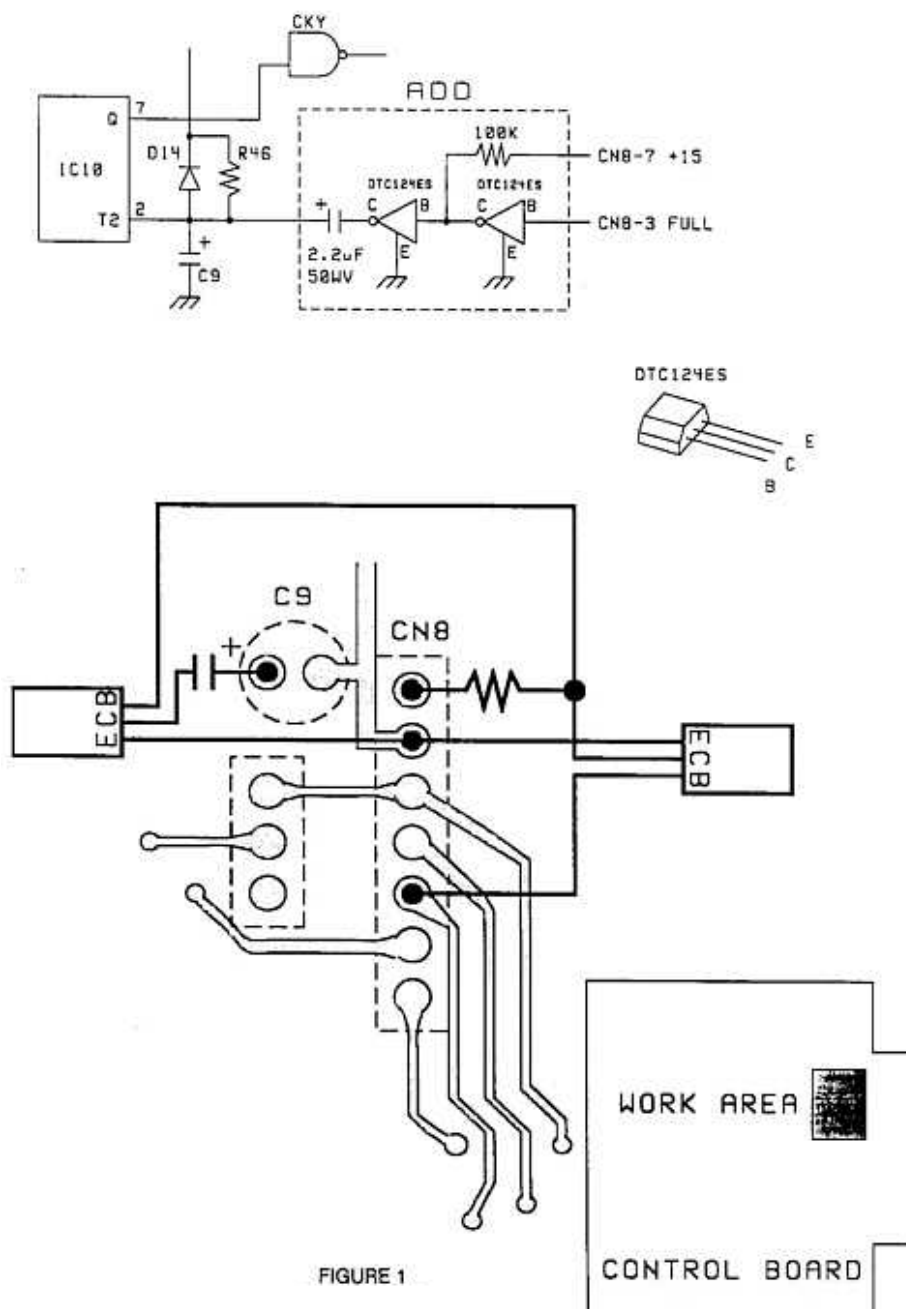
Pull the front panel assembly forward to expose the Digital and Control boards.

Remove the two screws that secure Control board B/3 to the top of the chassis and swing the board out of the way.

Remove the 4 screws from Control board A/3 and rotate the board down. Disconnect the right hand plugs as necessary to expose the foil side of the Control board.

Install the circuit shown in figure 1 on the foil side of Control board A/3.

Assemble the transceiver by reversing steps 1 - 7.



This modification is covered under the 1 year warranty.  
Time required to perform the modification is 1 hour or less.

*Trio-Kenwood Communication, inc.*

Service Bulletin no. 963 (17-1-1990)

Some early TS-950SD transceivers may exhibit a low Signal to Noise ratio on ten and fifteen meters. In addition, rotating the encoder may allow the user to hear a crackling noise in his headphones. The following modification will correct this condition.

**Note:** This modification has already been performed on model from serial number 101xxxx.

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).

Open the sub chassis as shown in figure 1 (remove 4 top screws, remove 3 back panel screws, unplug the RX ANT OUT and DRIVE IN connectors).

Remove the cover from the sub chassis (12 screws). Figure 1.

Remove the 9 screws from the Filter board.

Desolder the antenna connector wires at the antenna connector. Do not damage the surge absorber.

Rotate the Filter unit to expose the foil side of the board. Disconnect coax cables as necessary to rotate the board and remove the mesh plate as the board is rotated.

Cut the two foils as shown in figure 2.

Assemble the transceiver by reversing steps 1 - 7. Remember to install the mesh plate, resolder the antenna connector, and plug in the two connectors on the back panel.

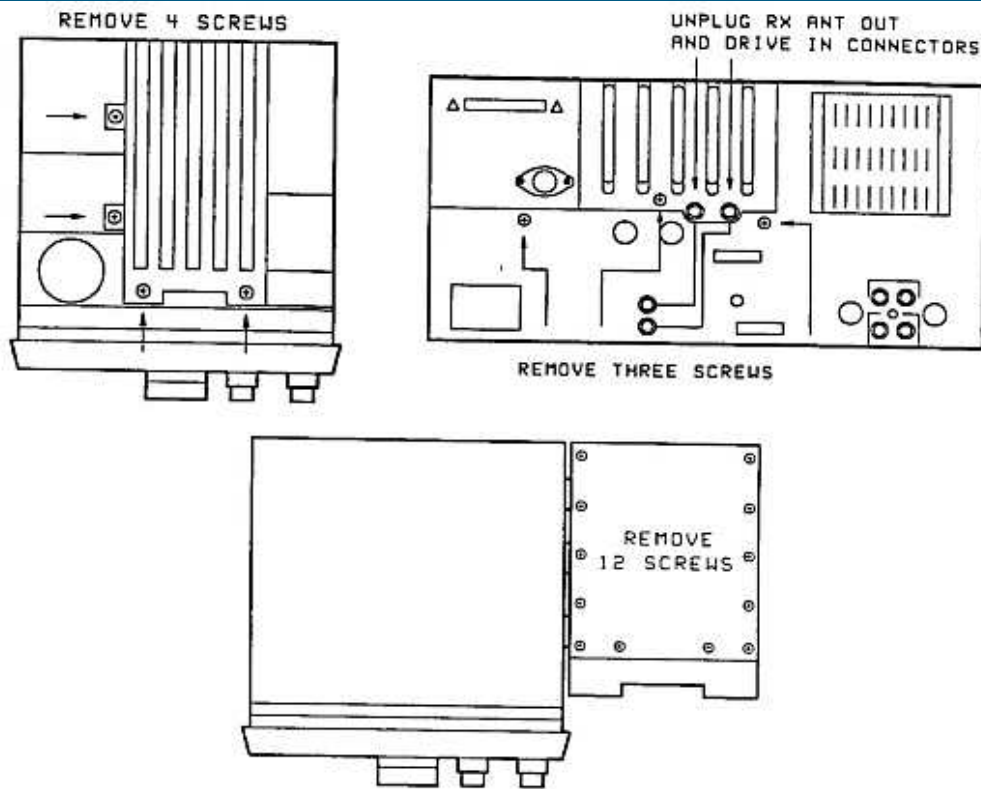


FIGURE 1

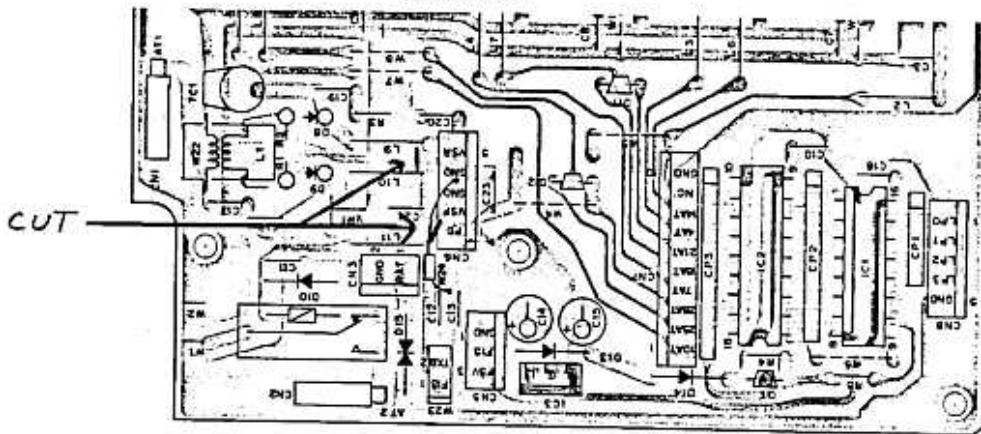


FIGURE 2

This modification is covered under the 1 year warranty.  
Time required to perform the modification is 1 hour or less.

### TS-950SD Two second TX power delay with MONI on

*Trio-Kenwood Communication, inc.*

Service Bulletin no. 964 (22-1-1990)

When the MONI switch is turned on, transmit power may not develop for two seconds after key down. During this time, the ALC meter will pin and the SWR meter will read high. This will more likely develop on 18 MHz and 21 MHz bands. The following modification will correct this condition.

**Note:** This modification has already been performed on model from serial number 0120441.

Required parts:

2.2 Kohm chip resistor (RK73FB2A222J)

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).



Locate the RF unit on the bottom of the transceiver. This is the back left board of the four boards on the bottom of the transceiver.

Remove the RF board shield plate (4 screws).

Remove the 3 remaining screws from the RF board.

Remove the black screw that secures the DRIVE OUT/RX ANT IN jack to the back panel.

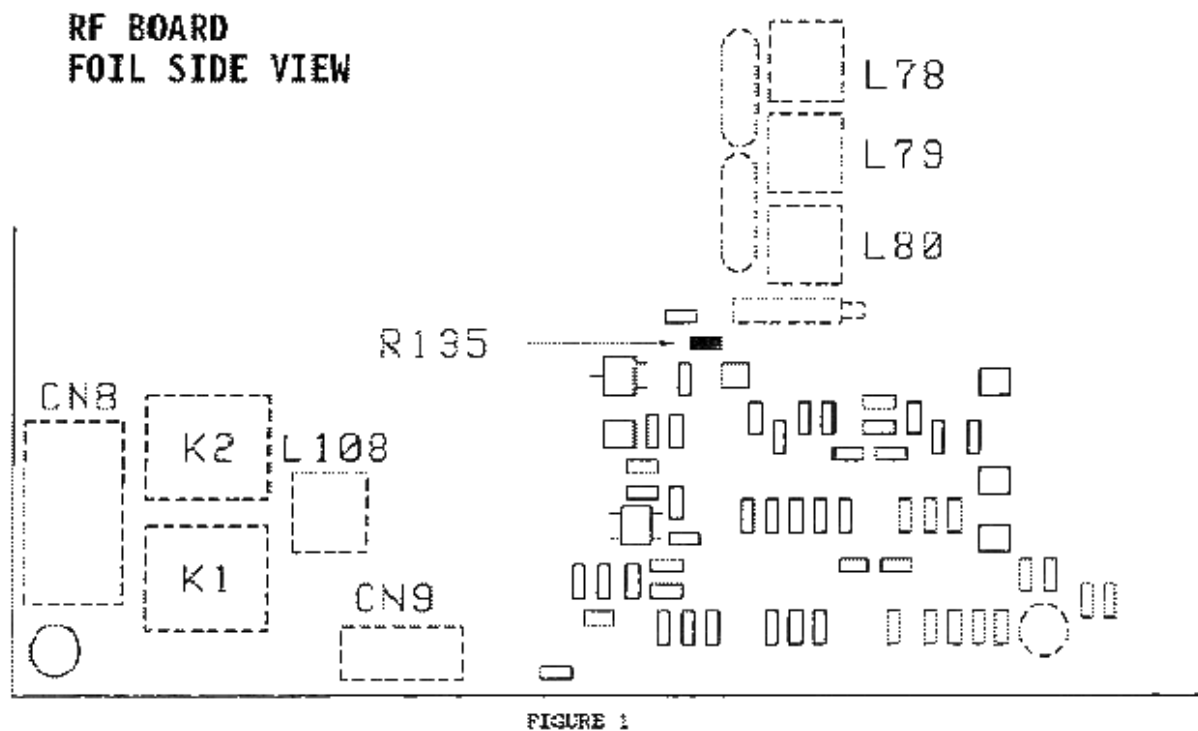
Disconnect the right hand coax cables from the RF board and unplug connector #2.

Slide the RF board forward and then rotate it towards the front of the transceiver to expose the foil side of the board.

Locate chip resistor R135 as shown in figure 1.

Replace R135 with a 2.2 Kohm chip resistor.

Assemble the transceiver by reversing steps 1 - 8.



This modification is covered under the 1 year warranty.  
Time required to perform the modification is 1 hour or less

#### TS-950/SD Receiver noise

*Trio-Kenwood Communication, inc.*

Service Bulletin no. 971 (29-5-1990)

About 1 mV noise is present at the speaker or headphone jack in the receive mode with the AF GAIN control set to minimum. If the transceiver is in the CW mode, a faint tone might also be heard through the headphones (sidetone leakage). The following modification will reduce the level of the noise and the tone.

Required parts:  
2SD1257K(S)

Disconnect the power cord and antenna.

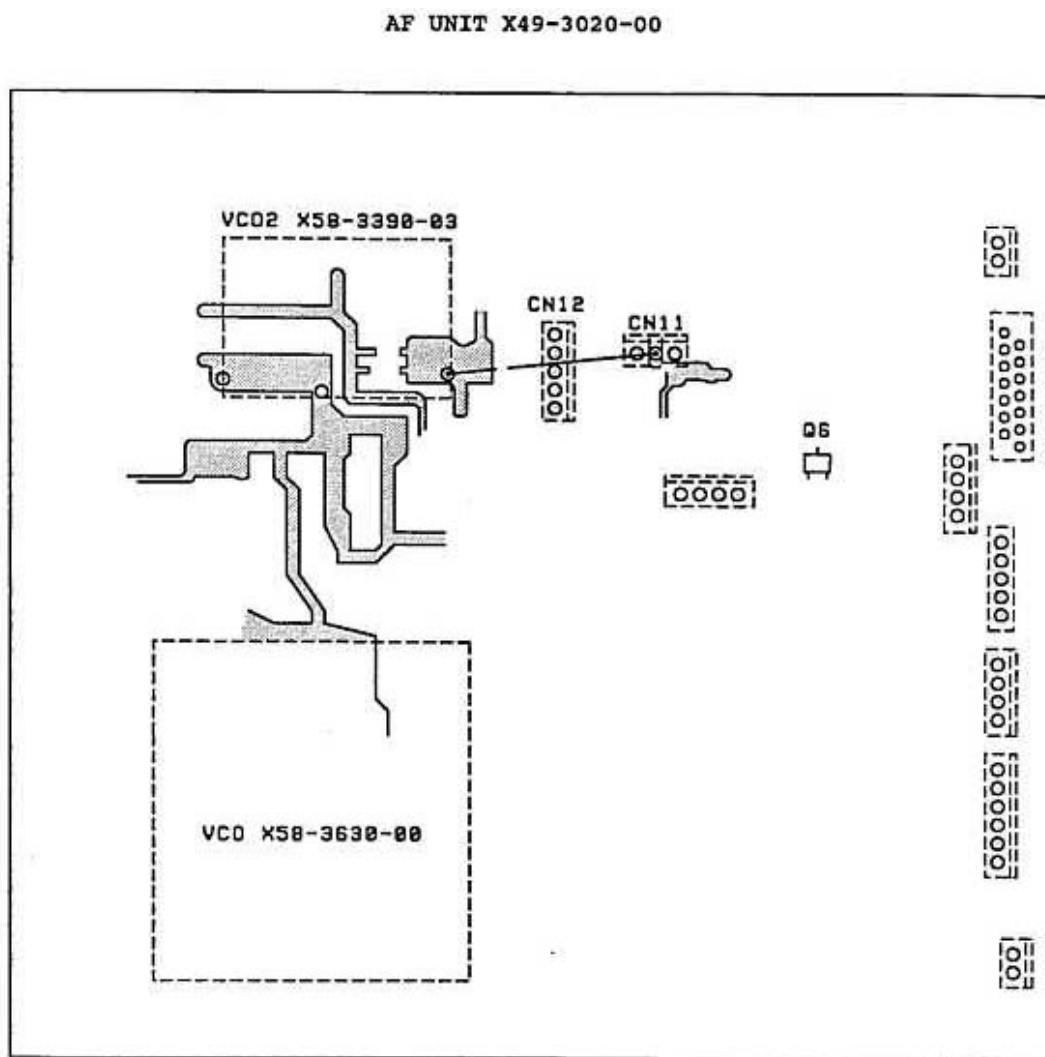
Remove the top and bottom covers (18 screws).

Locate the RF unit on the bottom of the transceiver. This is the back left board of the four boards on the bottom of the transceiver.

Remove the screws from the AF unit and disconnect the plugs as necessary to turn the board over to expose the foil side of the board.

Replace Q6 with a 2SD1757K(S).

Solder a 22 AWG jumper wire as shown in figure 1.



This modification may be covered under warranty.

Time required to perform the modification is 1 hour or less

Some TS-950SD owners have reported a transmit image at 18.115 MHz that cause the receiving station to hear distortion on the carrier. If the operating frequency is shift 3 KHz above or below 18.115 MHz, the image disappears. This modification will lower the image level from -30 dB (worse case) to better then - 40 dB by installing a trap on the 455 KHz I.F.

#### Required parts:

4 pF Trimmer capacitor	C05-0308-05
40 pF Trimmer capacitor	C05-0309-05
2.2 $\mu$ H coil	L40-2292-14

#### Modification:

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).

Locate the I.F. board on the bottom of the transceiver. This is the back right board of the 4 boards on the bottom of the transceiver. Figure 1.

Locate L36 by connector CN17 on the I.F. board. Figure 2.

Install and solder into place a 4 pF trimmer capacitor across L36. Figure 3.

Install a 2.2  $\mu$ H coil and 40 pF trimmer capacitor in series from the output of L36 to ground. The can of L31 can be used for ground. Figure 3.

#### Alignment:

Connect the TS-950S/SD to a power meter and 50 ohm load.

If you are working on the TS-950S digital, connect the DSP cables on the bottom cover to the back panel.

In the CW mode, adjust the front panel power control for 150 Watt while the ALC level is just at the starting point on the meter. This will create the highest image level condition.

Using a monitor receiver with narrow filters installed and AGC set to off, tune the receiver to the image frequency.

Alternately adjust the two trimmer capacitors until the image cannot be heard. This procedure may need to be repeated several times.

Push the wire harness around the I.F. board toward the chassis of the transceiver.

Assemble the transceiver.

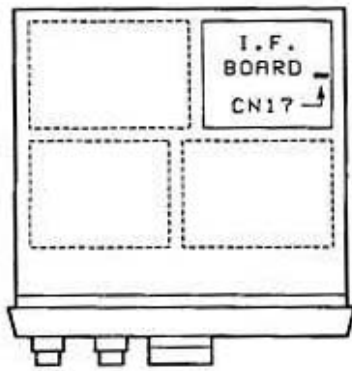


FIGURE 1

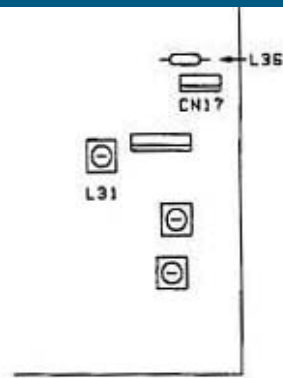


FIGURE 2

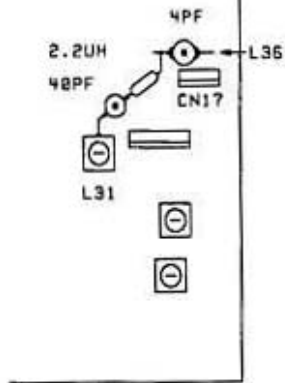
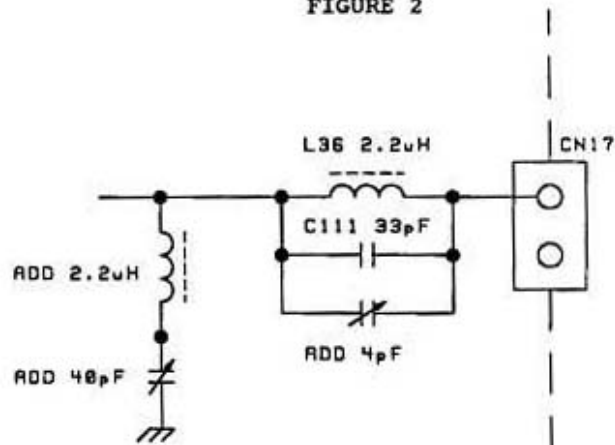


FIGURE 3



SCHEMATIC

This modification may be covered under 1 year warranty.  
Time required to perform this modification is 1 hour or less.

### TS-950S/SD 80 meter spurious emission

Kenwood Communication, inc.

Service Bulletin no. 984 (6-2-1991)

Some TS-950S/SD owners have reported a transmit spurious emission between 3.500 MHz and 3.520 MHz. The modification will reduce the spurious emission to - 65 dB.

Required parts:

10 pF capacitor	CC73FCH1H100J	QTY. 1
16 pF capacitor	CC73FCH1H160J	QTY. 1
12 $\mu$ H coil	L40-1201-17	QTY. 1
2.6 X 4 mm screws	N09-0650-05	QTY. 4

Disconnect the power cord and antenna.

Remove the top and bottom covers (18 screws).

Open the sub chassis to expose the PLL board (figures 1-3). To open the sub chassis remove 4 top screws, remove 3 back screws, and unplug the RX ANT OUT and DRIVE In connectors.

Replace the four VCO shield plate screws with the type listed above. Figure 3.

Close the sub chassis and secure it with the screws removed in step 3.

Locate the A.F. board on the bottom of the transceiver. Figure 4.

Remove the board's mounting screws and disconnect the necessary connectors to expose the bottom of the board.

Locate the foil pattern area shown in Figure 5. This area is below IC11.

Cut the foil pattern and add the components shown in Figure 6.

Assemble the transceiver. Remember to plug in the two connectors on the back panel.

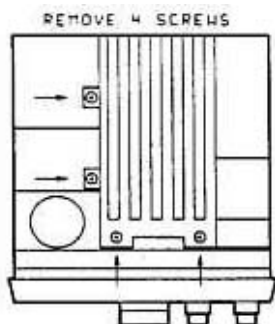


FIGURE 1

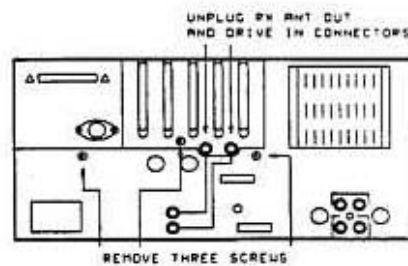


FIGURE 2

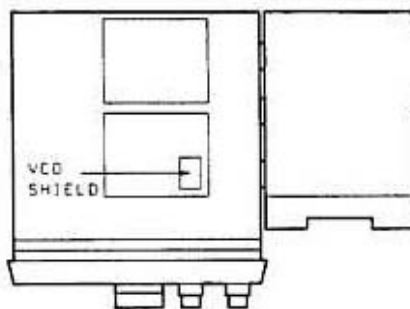


FIGURE 3

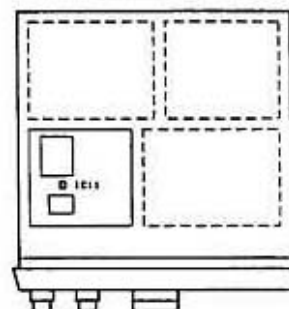


FIGURE 4

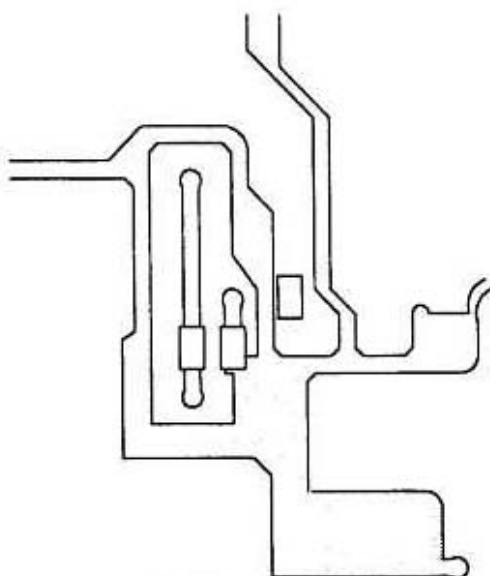


FIGURE 5

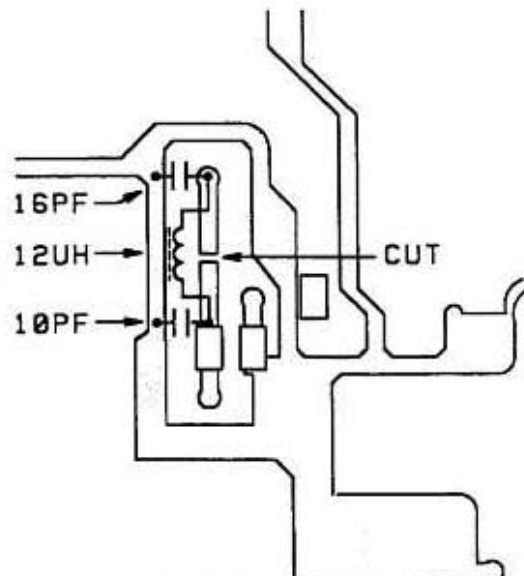


FIGURE 6

## TS-950S Final bias circuit change

*Author: Kenwood Communication, inc.*

Service Bulletin no. 990 (28-1-1992)

It is possible to exceed the maximum  $V_{cbo}$  rating of the MRF429 transistors used in the TS-950S/SD if the unit is operated at excessive transmit power levels (greater than the normal factory output power setting). This results in a collector to base short on the MRF429. This causes excessive current to be drawn thru R17 and or R18 of the final bias circuit. This can cause a large amount of smoke from the overloaded resistors. It does not normally cause damage to surrounding components. (You might wish to check Q7, VR2, Q8 and the fuse just as a precaution!)

R17 and R18 are carbon type resistors (27 ohms  $\frac{1}{2}$  w). Carbon resistors can emit quite a bit of smoke when overload in this manner and can be the cause of considerable concern by the operator!

In order to ease operator concern we recommend replacing R17, and R18 on the final unit (X45-3330-00) with ceramic resistors whenever replacing the final transistors. These special resistors have been designed to open quickly if the current rating is exceeded. This prevents smoking and the odors associated with burning resistors.

Parts required:

27 ohm  $\frac{1}{2}$  watt ceramic resistor, (R92-1286-05)

### Precautions:

The MRF-429 transistors generally fail one of two ways:

The collector/base junction opens. R17 and R18 are not damaged when this occurs.

If the MRF-429's are operated at RF power levels higher than the absolute maximum  $V_{cbo}$  rating the collector/base junction fails. This causes excessive current to flow thru the base circuit.

If the MRF-429's short collector to base with ceramic resistors there will be very little smoke before the resistor opens. The outward appearance of the resistors will not change, so you must make sure to check the resistors with an ohmmeter before installing new finals.

If R17 or R18 should open there will not be an appreciable change in the base circuit current. It is essential, however, that these resistors be in good working order as they ensure stable operation of the final amplifiers.

R17 and R18 must be replaced whenever you replace the final transistors. The ceramic resistors are easy to identify. They are rectangular and white in color.

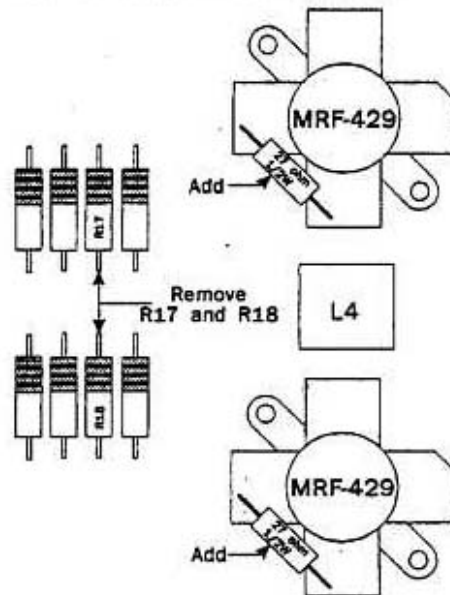
### Replacement Procedure:

Replace the bad MRF-429 transistors.

Remove R17 and R18 from the component side of the Final circuit board.

Solder the ceramic resistor directly to the base and emitter of the final transistors. The stability of the circuit is improved by soldering R17 and R18 directly to the base and emitter of the finals. Do not install them in the old locations!

## Final Unit (X45-3330-00) Component Side View



### TS-950S Rear panel cooling fan

*Author: Kenwood Communication, inc.*

Service Bulletin no. 991 (24-1-1992)

The 50 watt power down circuit will begin to operate if the cooling fan on the rear panel fails to operate after 15 minutes of continuous transmission in order to protect the final amplifier circuit. Failure of the fan will prevent the power down circuit from returning transmit power to normal levels since the transformer temperature remains high. This trouble can sometimes be traced to a pinched/burnt wire near resistor R17 of the AVR unit (X43-3070-01).

#### Causes:

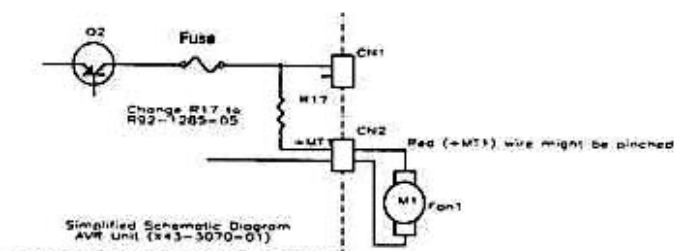
If the red wire attached to the connector CN2 of the AVR unit is pinched between the chassis and ground the insulation might be damage and allow this line to be short to the chassis. This wire supplies 15 Vdc to the fan motor thru resistor R17. Excessive current is drawn thru R17 under this circumstance, approximately 1.5 A rather than the normal .5 A. This can cause the resistor to become red hot and damage the surrounding circuit board, since R17 is a metal oxide film resistor.

#### Corrective action:

R17 should be replaced with a ceramic resistor if this symptom is encountered. Replacing the metal oxide film resistor with a ceramic resistor will prevent damage to the circuit board should the red lead become shorted.

#### Parts required:

10 ohm 2 watt ceramic resistor, R92-1285-05



## TS-950SDX Mode switching

*Kenwood Communication, inc.*

Service Bulletin no. 998 (3 August 1992)

Occasionally the TS-950SDX will transmit instantaneously when the mode is switched from SSB to CW with the VOX turned on. The frequency of occurrence depends upon the setting of the VOX GAIN and DELAY controls.

### Cause:

A small amount of RF feedback is felt on analog switches IC5 and IC6 in the AF unit. This RF causes the timing circuit to actuate briefly when the mode is changed with VOX ON.

**Warning:** This radio uses micro-sized surface mount component, and/or multi-layer circuit boards. *If you are not familiar with the techniques for service of this type of equipment do not attempt this modification yourself.* You will invalidate your warranty if you attempt to modify the equipment and damage the radio. If you are at all in doubt about your qualification to perform this modification you should seek qualified assistance.

### Required parts:

C191: 4.7  $\mu$ F, 25 V electrolytic capacitor (CW04EW1W4R7M)

### Procedure:

Unplug the DSP unit from the rear of the transceiver.

Remove the top and bottom covers (18 screws).

Turn the units so the bottom is up.

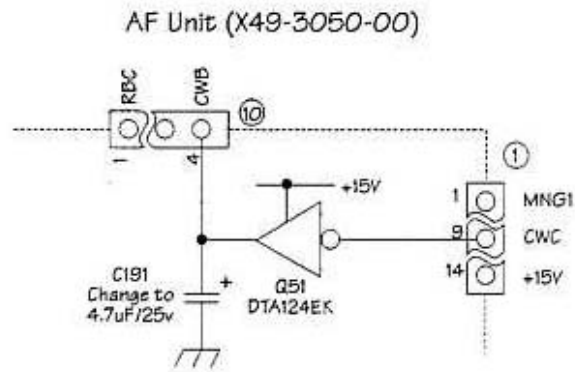
The AF unit is located in the front left hand corner.

Remove the 8 screws securing the AF unit to the chassis.

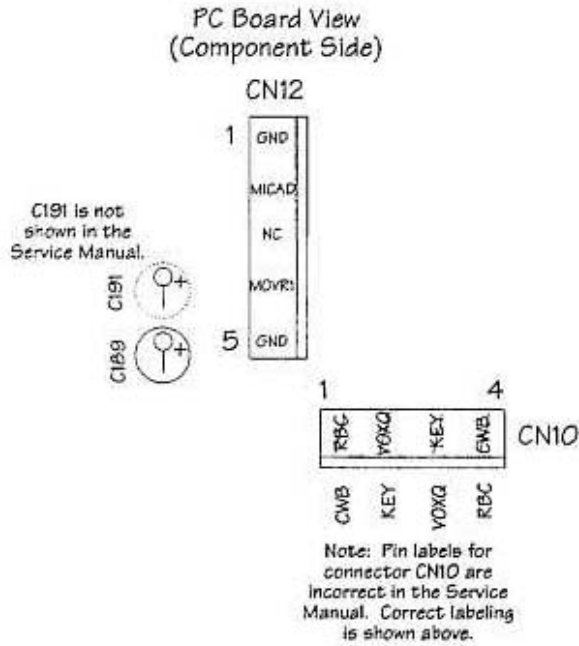
Add C191 in the position indicated in figure 2.

Reverse steps 1 - 5 to reassemble.





(Figure 1)



(Figure 2)

This modification may be covered under warranty.  
Time required for this modification is 1 hour or less.

## TS-950SDX No beep in headphones

Kenwood Communication, inc.

Service Bulletin no. 999 (4 August 1992)

Several owners of the TS-950SDX have reported the absence of an audio confirmation tone when using monaural headphones. The tone is present when listening with stereo headphones but only from the right hand speaker element.

### Cause:

In this design the SUB AF PA circuit supplies audio when using a monaural headphone, and the MAIN AF PA supplies audio to the right speaker of a stereo headphone. The audio confirmation tone is not applied to both the SUB AP PA and the MAIN AF PA. To simplify circuit design the tone is only routed to the MAIN AF PA. Unfortunately this left monaural users without a confirmation tone and stereo headphone users with a confirmation tone only in the right side of the headphones.

### Correct action:

The following modification permits the user to hear the audio confirmation tone from both sides of a stereo headphone and from a monaural headphone.

**Warning:** This radio uses micro-sized surface mount component, and/or multi-layer circuit boards. *If you are not familiar with the techniques for service of this type of equipment do not attempt this modification yourself.* You will invalidate your warranty if you attempt to modify the equipment and damage the radio. If you are at all in doubt about your qualification to perform this modification you should seek qualified assistance.

**Required parts:**

R138: 100 Kohm radial lead ¼ watt resistor, (RD14BB2C104J)

**Procedure:**

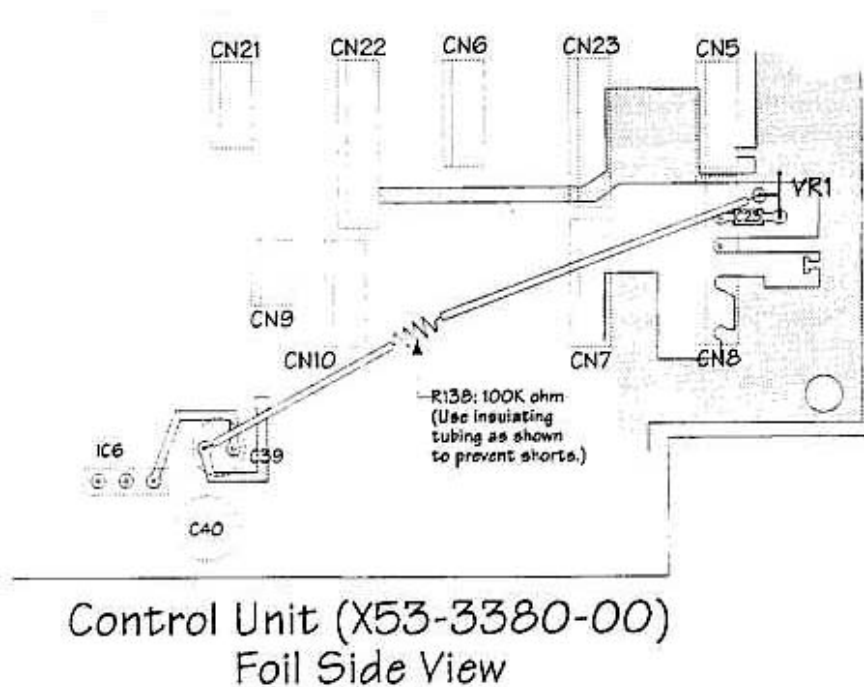
Unplug the DSP Unit from the rear of the transceiver.

Remove the top and bottom covers (18 screws).

Remove one screw from each side of the front panel and tilt the front panel forward.

Add R138 from the wiper arm of VR1 to the negative side of C39 as shown in the accompanying diagram.

Reverse steps 1 - 3 to reassemble.



This modification may be covered under warranty.

Time required for this modification is 1 hour or less

**TS-950SDX Distorted DRU-2 TX audio**

*Communication, inc.*

Service Bulletin no. 1001 (4 November 1992)

We have received several reports of minor distortion of the DRU-2 transmitted audio when used with the TS-950SDX. Recordings made from incoming received sources do not appear to be distorted.

**Cause:** This characteristic is caused by an impedance mismatch between the DRU-2 output and the input of the microphone amplifier circuit in the TS-950SDX. The following modification will correct/improve this characteristic.

**Procedure:**

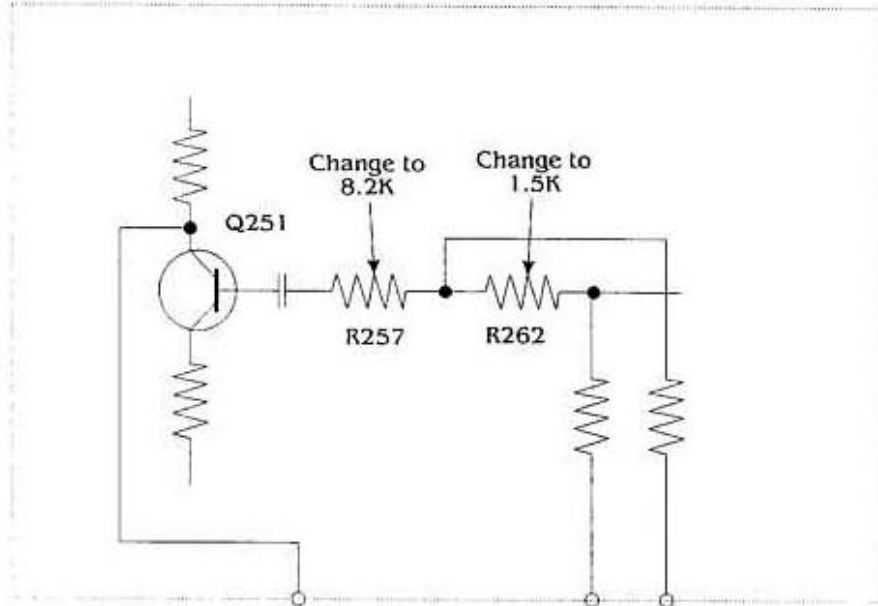
On the Microphone Amplifier Unit (X59-3710-01), which is part of Switch Unit (A) (A41-3240-00) (H/10): (The Microphone Amplifier Unit is a small daughter board located on the switch assembly that has the Microphone Gain/Power Output Control and the Speech Processor IN/OUT controls).

Change chip resistor R257 from 4.7 Kohm to 8.2 Kohm (RK73FB2A822J)

Change chip resistor R262 from 4.7 Kohm to 1.5 Kohm (RK73FB2A152J)

**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

## MIC AMP (X59-3710-01)



Time required for this modification is 30 minutes or less.

### TS-950SDX w/K1EA Ver. 8 Program (Revised)

Kenwood Communication, inc.

Service Bulletin no. 1003 (1 June 1993)

We have received several reports of the transmitter unkeying when using the K1EA Contesting program. This symptom only occurs when the TS-950SDX is used with version 8 of the K1EA program. Apparently some of the more advanced control features of this new version of the program cause the radio to think the program has unkeying. A new EPROM is available that corrects this transmitter drop out.

#### Parts required:

IC-19 Microprocessor, (27C512RJDVF), QTY. 1

#### Procedure:

Remove the top and bottom covers of the TS-950SDX.

Carefully unplug the two DSP units cables from the rear of the transceiver.

The front panel of the radio is designed to allow it to be tilted forward for ease of service. To tilt the front panel forward remove the screw at the top of the brackets that secure the front panel to the chassis. (Please refer to the Accompanying diagram). There is one screw on each side of the front panel.

Next loosen the remaining screw at the bottom of each bracket.

Gently pull the bottom of the front panel forward until it reaches the end of the slot in the bracket and gently pull the top of the front panel down.

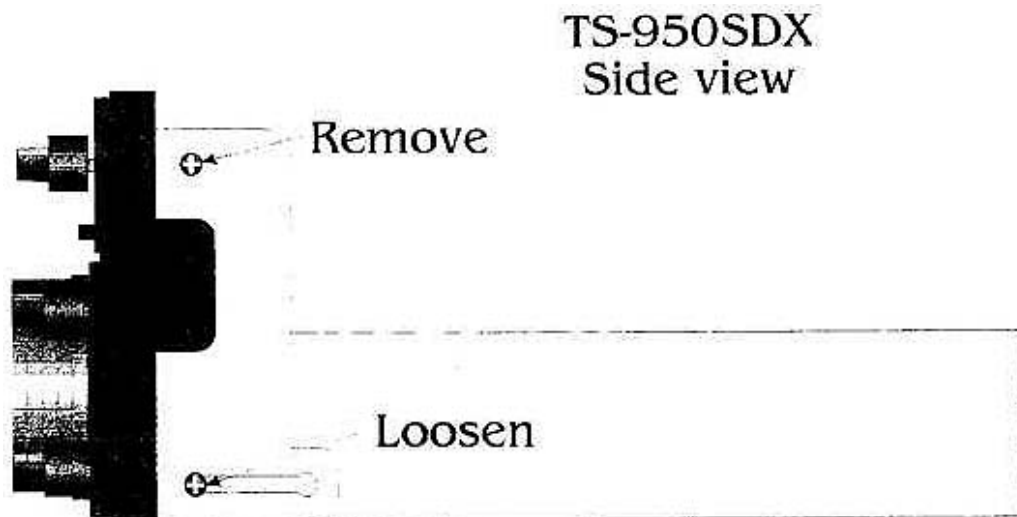
Now look at the circuit board mounted vertically on the main chassis. This is the Digital Unit (X46-3130-11). Near the center of this board you will find the lithium battery for memory backup and a large IC installed in a socket. This is the EPROM.

Carefully remove the IC from the socket. Use an IC pull or very gently pry it out by slipping a small flat tool between the IC and the socket. Do not use excessive pressure as you can damage the circuit board if you pry too hard!

Take the new EPROM and carefully install it in the now vacant socket. Note that the notch on the end of the EPROM should be down.

Reverse steps 1 - 5 to reassemble. Make certain you do not pinch any wires when you return the front panel to its vertical position.

You will need to reset the microprocessor after the radio is reassembled. This is done by pressing and holding the A=B key while the power is turned on, and then release the key.



**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

*Time required for this modification is 30 minutes or less.*

### TS-950SDX Speech processor

*Kenwood Communication, inc.*

Service Bulletin no. 1007 (25 January 1993)

#### **Symptom:**

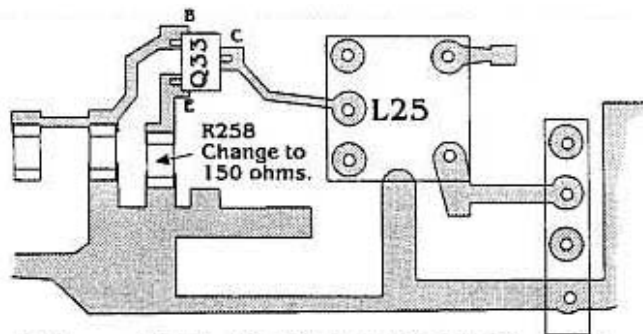
Reports of low COMP meter sensitivity, or noise on the transmitted audio when using the speech processor is normally a result of misadjustment of the PROC IN control. This control is very sensitive and is difficult to adjust properly.

#### **Parts required:**

150 ohm chip resistor, (RK73FB2A151J)

#### **Procedure:**

Change the value of R258 in the SIG unit (X57-4130-00) from 68 ohm to 150 ohm. This will increase the available adjustment range of the PROC IN control. This will make it much easier to properly adjust the control and thus avoid overdriving the speech processor circuit.



**Signal Unit (X57-4130-00)  
Foil Side View**

**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

Time required for this modification is 30 minutes or less.

### TS-950SDX 3rd order IMD standardization

*Kenwood Communication, inc.*

Service Bulletin no. 1009 (25 January 1993)

#### Symptom:

3rd order IMD figures have been noted that do not meet out standard value of -32 to -35 dB.

#### Cause:

We have found that this symptom can be caused by either improper bias to the final transistor and/or because of distortion inducted by the 73.05 MHz IF mixer circuit.

#### Parts required:

R195, R197, R198 150 ohm chip resistor RK73FB2A151J QTY. 3  
 R204 4.7 Kohm chip resistor RK73FB2A472J QTY. 1  
 R19, R20 22 ohm carbon resistor RC05GF2H220J QTY. 2

#### Procedure:

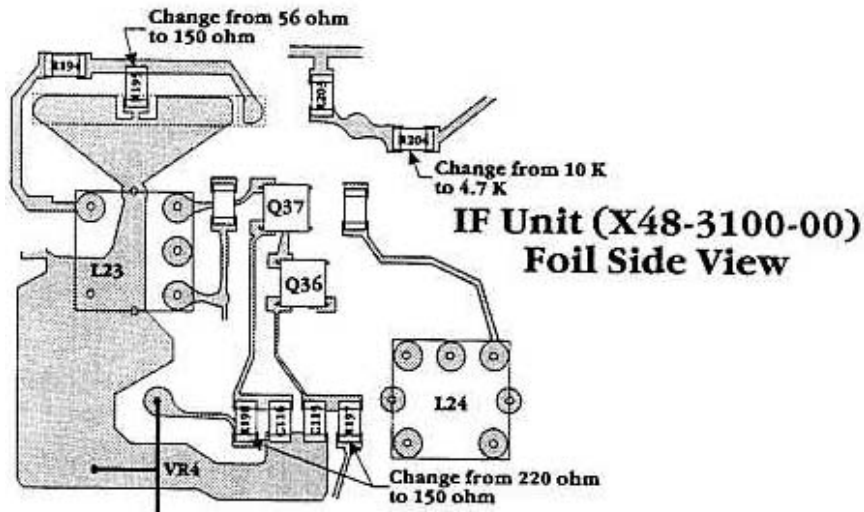
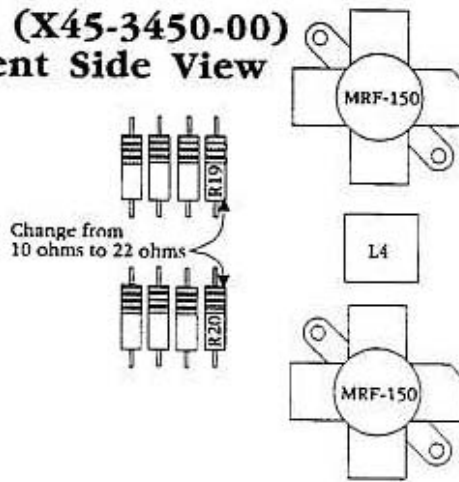
On the Final unit (X54-3450-00) change R19 and R20 from 10 ohm to 22 ohm. Figure 1.

On the IF unit (X48-3100-00): Figure 2.

- Change R195 from 56 ohm to 150 ohm.
- Change R197 from 220 ohm to 150 ohm.
- Change R198 from 220 ohm to 150 ohm.
- Change R204 from 10 Kohm to 4.7 Kohm.

No additional adjustment or modification will be required.

## Final Unit (X45-3450-00) Component Side View



**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

Time required for this modification is 1 hour or less.

### TS-950SDX Key click w/bug type Keyer

*Kenwood Communication, inc.*

Service Bulletin no. 1012 (3 May 1993)

#### Symptom:

A "bug" type Keyer used at high keying speeds might cause a key click or chattering noise on the transmitted signal. When the internal electronic keyer is used no such chattering noise is encountered.

**Cause:** The internal chatter absorption filter circuit incorrectly tries to remove noise from the external Keyer.

#### Procedure:

Press the MENU key one time.

Select MENU no. 12 by tuning the M.CH knob.

Press the UP key until OFF appears in the display.

Press the MENU key one time to exit the MANU mode.

Turn off the POWER SW.

Turn ON the POWER SW while depressing the MENU key.

Select MENU 69 by tuning the M.CH knob.

Press the DOWN key until OFF appears in the display.

Press the MENU key one time to exit the MENU mode.

This operation turns off the internal chatter absorption filter circuit.

Time required for this modification is 15 minutes or less.

### TS-950 Hum with monitor ON

*Author: Kenwood Communication, inc.*

Service Bulletin no. 1016 (12 May 1993)

#### Symptom:

On early versions of the TS-950 series (below serial number 106xxx) a hum might be heard when the MONI function is active and headphones are connected to the PHONE jack. No hum is experienced when the MONI circuit is OFF

#### Cause:

This noise can only be found in the monitor circuit itself and not on the transmitted signal. We have found that the VCO shield cover for the PLL unit might be contacting the shield plate for the filter unit. This physical contact can allow a slight amount of vibration to be felt in the sub-receiver section. This vibration, combined with too much gain in the sub-receiver section contributes to the hum.

#### Parts required:

Qty	Description	Kenwood Part No.	Circuit description
4	Low profile PLL Unit cover screws	N35-2640-05	NA

#### Procedure:

On the IF unit (X48-3060-00) adjust VR-1 to the point the audio output just decreases when the MONI circuit is activated.

Replace the screws on the VCO unit shield case with the new low profile screws.

Time required for this modification is 15 minutes or less.

## = TS-950 Noise with Sub-Band noise blanker ON

*Kenwood Communication, inc.*

Service Bulletin no. 1017 (13 May 1993)

**Symptom:**

Noise is generated when NB1 is switched on for the sub-receiver.

**Cause:**

Switching noise from the noise-blanker gate enters the AF amplifier via the +15 V line causing the noise.

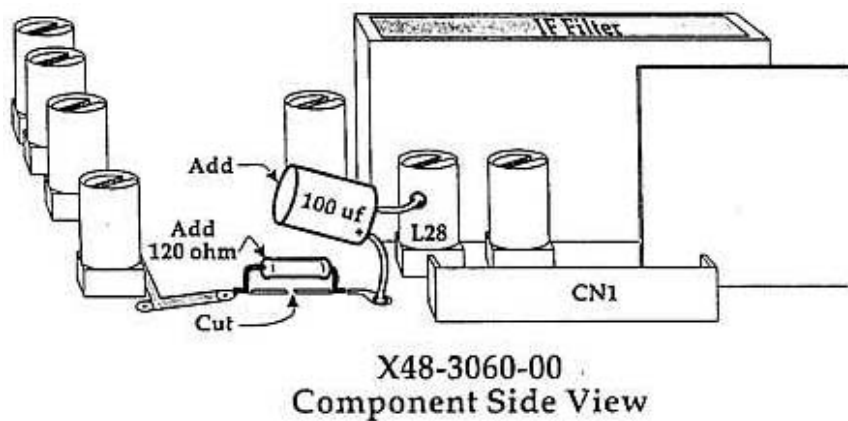
**Parts required:**

Qty	Description	Kenwood Part No.	Circuit description
1	100 $\mu$ F, 16 V electrolytic capacitor	CE04KW1C101M	NA
1	120 ohm resistor	RD14BB2B121J	NA

**Procedure:**

Cut the pattern of the 15 V line on the IF unit (X48-3060-00) component side, near Q34's emitter and add the 120 ohm resistor as shown in the accompanying diagram.

Add the electrolytic capacitor as shown in the diagram. Quickly solder the negative lead to the metal shield of L28.



Time required for this modification is 15 minutes or less.

## TS-950 14.200 MHz transmit spur



**Symptom:**

A close-in transmit spur might be present on early model TS-950(S) (serial number 1010xx and below) transceivers when operating at a dial frequency of approximately 14.200 MHz. This spur is seen approximately -40 to -50 dB down from the fundamental.

**Cause:**

The output from the mixer (IC12) which generates the final PLL loop comparison frequency for the AF unit contains harmonic radiation at approximately 36 to 68 MHz.

**Parts required:**

Qty	Description	Kenwood Part No.	Circuit description
1	Broad band transformer	L19-0346-05	L15
1	.001 $\mu$ F 50 V capacitor	CK45B1H103K	C127

**Procedure:**

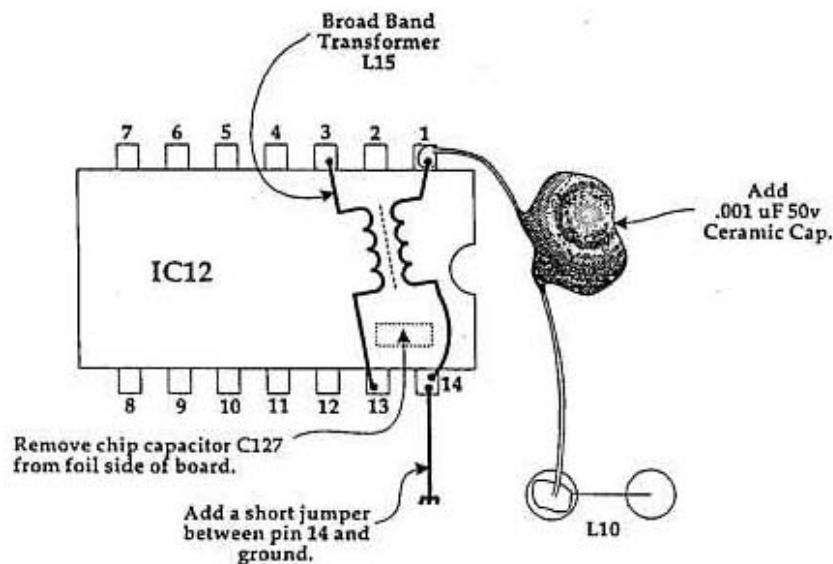
Solder the primary of the transformer to pins 3 and 13 of IC12. You will have to bend the terminals slightly.

Solder the secondary of the transformer to pin 1 and 14 of IC12.

Remove chip capacitor C127 from the foil side of the board.

Connect pin 14 of IC12 to the ground pattern.

Add the new C127 from pin 1 of IC12 to L10 as shown in the accompanying illustration.



### AF Unit (X49-3020-00) Component Side View

**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

Time required for this modification is 30 minutes or less.

**TS-950 Low power output after temp. protection***Kenwood Communication, inc.*

Service Bulletin no. 1019 (14 May 1993)

**Symptom:**

After transmitting for approximately 2 hours at 50% duty with 150 watts output the temperature protection circuit activates reducing the output power to about 50 watts. Normally, full output power will be restored after the fans have had a chance to cool things down. Occasionally the power output will not return to normal, even after extended receive operations.

**Cause:**

The temperature sensor is attached to the main transformer and is set to activate at 80°C. This setting was selected to reduce power before the internal fuse on the transformer opens.

**Correct action:**

After through testing, we have found that the temperature sensor should be set to 90°C to allow proper return to full power transmit. This setting will also allow the radio to be used at higher ambient room temperatures without worrying about the power output dropping in the middle of a QSO.

**Parts required:**

Qty	Description	Kenwood Part No.	Circuit description
1	90°C Thermal switch	S59-1416-05	S1

**Caution:** *This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.*

Time required for this modification is 30 minutes or less.

**TS-950 Infinite SWR at beginning of transmission***Kenwood Communication, inc.*

Service Bulletin no. 1020 (14 May 1993)

**Symptom:**

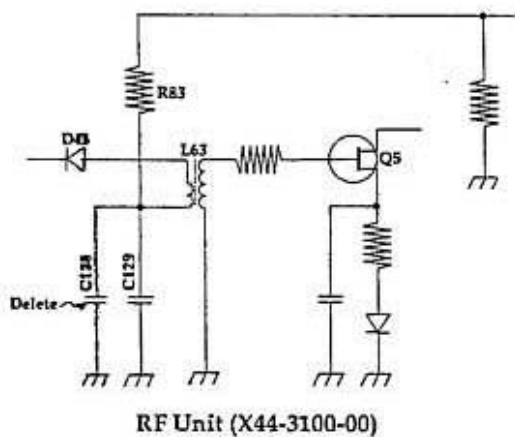
During "Full Break-in" operation the SWR meter shows infinite SWR at the beginning of transmission. This results in a reduction of the transmitter power, followed by a gradual increase to normal full power. This symptom does not occur with the antenna tuner set to "THRU".

**Cause:**

Normally the RCB line should be 0 Vdc at the beginning of transmit operations. We have found that this does not always occur. The length of time required for transmit power to return to normal is directly related to the time constant of capacitor C128 on the RXB line.

**Correct action:**

Removing this capacitor corrects the above symptom, but might affect the receiver sensitivity at a dial frequency of 100 KHz. This action is only recommended if the symptom is actually present. Do not modify the unit if the symptom is absent.



**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

Time required for this modification is 30 minutes or less.

### TS-950 Smoke from antenna tuner unit

*Kenwood Communication, inc.*

Service Bulletin no. 1021 (14 May 1993)

#### Symptom:

When tuning into an antenna with high SWR the SWR meter reading becomes unstable and a small amount of smoke is seen coming from the antenna tuner.

#### Cause:

One of the 3 x 4 self tapping screws that is used to secure the AT unit hinge can occasionally damage the insulation on the brown lead wire. When the tuner is then load into a high SWR the high reflected voltage causes the lead to head up, which further damages the insulation. Eventually the insulation breaks down completely and the wire shorts to the screw causing the lead to overheat and smoke to emanate from the area.

#### Correct action:

Cut a 12 cm long piece of the fiberglass insulating sleeve and install it over the brown lead wire to prevent shorting.

#### Parts required:

Qty	Description	Kenwood Part No.	Circuit description
1	12 cm Fiberglass insulating sleeve	212-3502-05	W101

(Note: The insulating sleeve must be ordered in increments of 1 meter or greater).

Time required for this modification is 30 minutes or less.

## TS-950S/SDX Transmit spur

Kenwood Communication, inc.

Service Bulletin no. 1024 (27 May 1993)

**Symptom:**

A transmitter spur might be present at a dial frequency of xx.xx1 MHz. This spur ( $f_o \pm 1$  KHz) is quite small (-55 dB relative to  $f_o$ ) but might become noticeable when the transceiver is used with a linear amplifier.

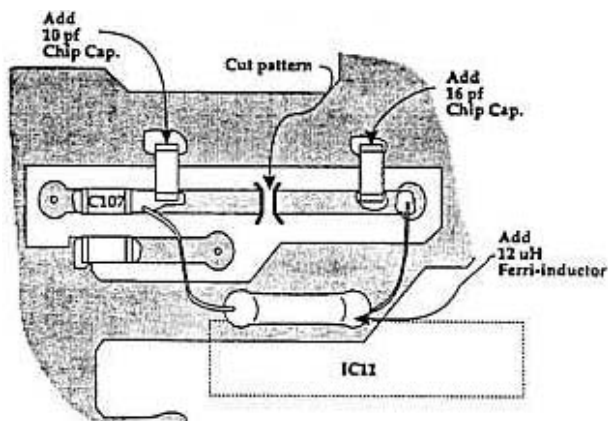
**Cause:**

The transmitted signal enters pin 5 of IC11 which is in the last PLL loop in the AF unit due to RF feedback. This pin is the input for the 10 MHz Ref. Osc. signal from the CAR unit. IC11 is the source of the spurious signal since both the band and 10 MHz frequencies are divided by the 500 KHz comparison frequency supplies by IC11.

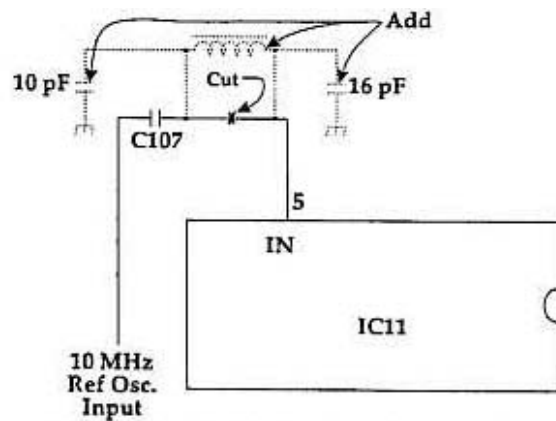
**Correct action:** To reduce this RF feedback increase the Ref. Osc. level from .2 V to .7 V ms by adding the accompanying circuit to the input of IC11.

**Parts required:**

Qty	Description	Kenwood Part No.	Circuit description
1	12 $\mu$ H Ferri-inductor	L40-1201-17	NA
1	10 pF Chip capacitor	CC73FCH1H100J	NA
1	16 pF Chip capacitor	CC73FCH1H160J	NA



AF Unit (X49-3020-00)  
Foil Side View



**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

Time required for this modification is 30 minutes or less.

## TS-950SDX "click noise" with NOTCH ON

Kenwood Communication, inc.

Service Bulletin no. 1026 (7 June 1993)

**Symptom:**

A click noise might be generated when receiving a strong signal (S-0 or above) when the NOTCH is ON and the Notch Control is turned away from the notch point.

**Corrective action:**

Lengthening the AGC release time of the IF Amp just before the NOTCH circuits will correct this symptom. The enclosed modification has been designed to change the time constant only when the NOTCH circuit is activated. Do not install this modification on sets that do not exhibit this symptom as the AGC FAST time constant affected by this change.

Cut the printed circuit foil pattern between the test point (TP) and gate 2 of Q2 as shown.

Install the 47 Kohm chip resistor from TP to gate 2 of Q2.

Add a 0.047  $\mu$ F ceramic capacitor as shown in the accompanying illustration.

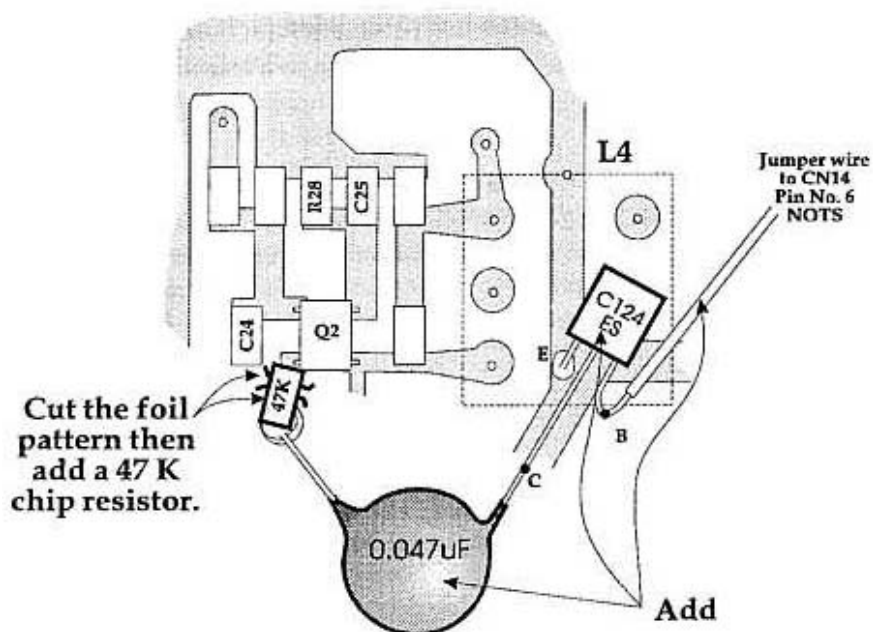
Add the DTC124ES transistor as show.

**Note:** The .047  $\mu$ F capacitor and the digital transistor must be connected together as shown and installed so that they do not touch the surrounding board patterns.

Install a jumper wire from the base of the digital transistor to pin number 6 of CN14.

**Parts required:**

Qty	Description	Kenwood Part No.	Circuit description
1	0.047 $\mu$ F capacitor	CK45B1H473Z	NA
1	Digital transistor	DTC124ES	NA
1	47 Kohm chip resistor	RK73FB2A473J	NA



**Signal Unit (X57-4130-00)  
Foil Side View**

**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance.

Time required for this modification is 30 minutes or less.

### TS-950SDX YG-455S-1 Installation note

*Kenwood Communication, inc.*

Service Bulletin no. 1043 (28 March 1994)

**Symptom:**

When the YG-455S-1 is installed, the LSB audio is slightly off pitch. This characteristic is corrected using the "Service Adjustment" menu. Early models of this transceiver did not make this adjustment available the individual operator unless they had access to a service manual.

**Countermeasures:**

A menu option has been added to Menu 07 on late versions of the transceiver which allows the individual operator to "correct" this audio shift. This has been accomplished by changing the program of the ROM chip IC-19 on the Digital unit X46-3130 1/2, and by updating the operators manuals. Installing the new ROM on early versions of this transceiver will allow the operator the same convenience as provided on later serial numbered sets.

**Parts required:**

Qty	Description	Old part No.	New Part No	Circuit Description
1	ROM	27C512BJDUF	27C512BJDUG	IC-19
		or		
1	ROM	27C512RJDVF	27C512BJDUG	IC-19
1	Instruction manual	B62-0229-30	B62-0229-40	

Time required for this modification is 30 minutes or less

### TS-950SDX No VFO B after "split"

*Kenwood Communication, inc.*

Service Bulletin no. 1045 (28 March 1994)

**Symptom:**

Using the following key sequence will result in a failure to receive on VFO B.

Select different frequencies for VFO A and B. (Example: 14.019 for VFO A and 14.018 for VFO B. Mode SSB, 2.7 KHz FILTER for 455 KHz and 8.83 MHz).

Select VFO A to RX and VFO B to TX. The press the TF-W key.

Press the ENT key and select a frequency in the 7 MHz band. (For example: 7.018 MHz for VFO A and 7.019 for VFO B).

Press the ENT key and reselect the 14 MHz band.

Change VFO B from TX to RX. The FILTER display for 8.83 dissapears and reception is disabled on VFO B.'

**Countermeasure:**

Press the 8.83 MHz FILTER select key one time, or replace the ROM chip.

**Parts required:**

Qty	Description	Old part No.	New Part No	Circuit Description
1	ROM	27C512BJDUG	27C512BJDUJ	IC-19
		or		
1	ROM	27C512BJDVG	27C512RJDVJ	IC-19

Time required for this modification is 30 minutes or less.

### TS-950SDX Carrier point adjustment

*Kenwood Communication, inc.*

Service Bulletin no. 1047 (28 March 1994)

#### Symptom:

The background audio tone is different between the LSB and the USB mode, when no signal is present, i.e. the carrier point is incorrect. Occasionally, this tone is still different after adjustment per the service manual, specifically Item 9 on page 196.

#### Countermeasure:

Change the adjustment procedure for Item 9 as follows:

#### Test Equipment

Two RF signal generators with good frequency accuracy.  
A two-signal combiner.  
An oscilloscope.

#### Preparation:

Adjust the two signal generators for equal output levels.

Connect the test equipment as shown in the accompanying diagram.

Set the frequency of SSG1 to 1.850.2 MHz.

Set the frequency of SSG2 to 1.852.8 MHz.

Fine tune the output levels of the two SSG's for a good two-tone output on the oscilloscope (Figure 3).

#### Adjustment Procedure:

Connect the transceiver and the test equipment as shown in figure 2.

Select the adjustment Mode on the transceiver by pressing and holding the 3 and 9 keys on the keypad while the POWER is turned on.

Set the output of the two signal generators for a - 73 dBm level.

Set the SSB SLOPE TUNE control to the NORMAL position.

Set the AGC to AUTO

Select MENU 00 using the M.CH/VFO knob.

Select USB mode.

Press the 8.83 MHz filter key until there is no indicator illuminated (no filter).

Press the 455 KHz filter key until 2.7 K appears in the display.

Set the frequency to the transceiver to 1.850.0 MHz.

Adjust the TX VFO/SUB encoder control until the waveforms displayed on the oscilloscope cross as shown in figure 3.

Switch to LSBV.

Press the 8.83 MHz filter key until 6 KHz appears in the display.

Leave the 455 KHz filter set at 2.7 KHz.

Select a dial frequency of 1.853.0 MHz.

Adjust the TX VFO/SUB encoder control until the waveforms displayed on the oscilloscope cross as shown in figure 3.

Select MENU 01.

Switch to USB.

Press the 8.83 MHz filter key until 2.7 KHz appears in the display.

Leave the 455 KHz filter set at 2.7 KHz.

Select a dial frequency of 1.850.0 MHz.

Adjust the TX VFO/SUB encoder control until the waveforms displayed on the oscilloscope cross as shown in figure 3.

Select LSB.

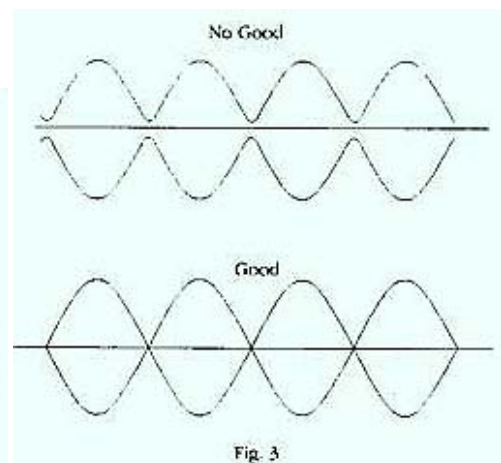
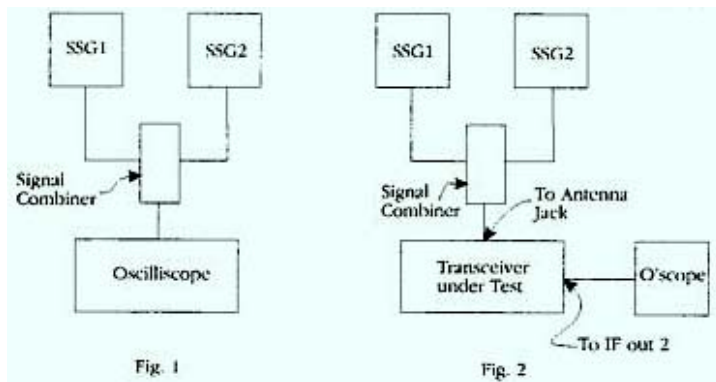
Select a dial frequency of 1.853.0 MHz.

Both filters should remain at 2.7 KHz.

Adjust the TX VFO/SUB encoder control until the waveforms displayed on the oscilloscope cross as shown in figure 3.

Note: This completes the adjustment.

To return to the normal display and save these setting you should press the CLR key one time.



Time required for this modification is 60 minutes or less.



## TS-950SDX Sub band residual noise

Kenwood Communication, inc.

Service Bulletin no. 1050 (28 March 1994)

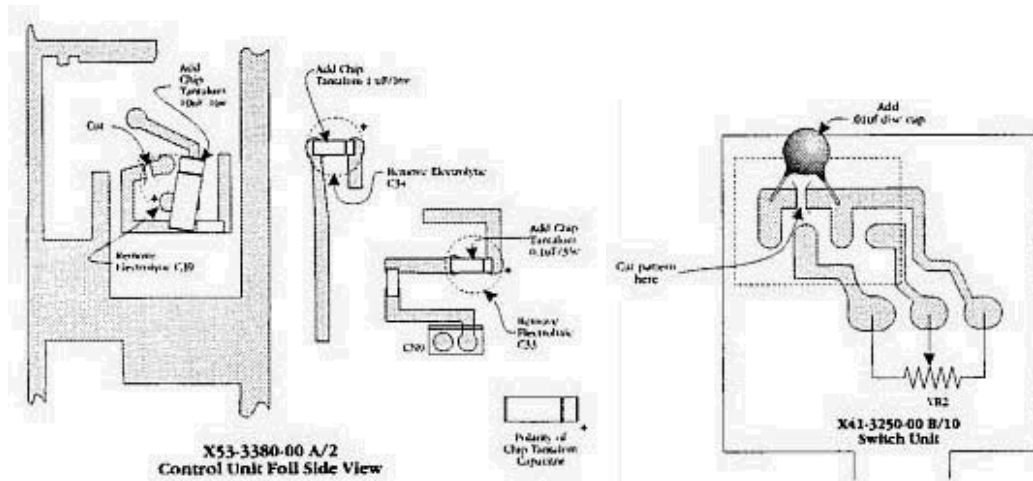
**Symptom:**

The level of residual noise (AF VOL at Min) on the SUB band is slightly higher than that of the MAIN band. This is especially true at audio frequencies of around 50 Hz, as viewed on a spectrum analyzer. As a result the SUB receiver is more susceptible to motor noise, such as might be generated by fans, refrigerators, etc.

**Countermeasure:** Replacing the Control unit electrolytic capacitors (C33, C34, and C39) with Tantalum capacitors, and adding the bypass capacitor to the Switch unit reduces or eliminates this symptom.

**Parts required:**

Qty	Description	Kenwood Part No.	Circuit Description
1	0.1 $\mu$ F 35 V Tantalum capacitor	C92-0001-05	C33
1	1.0 $\mu$ F 16 V Tantalum capacitor	C92-0004-05	C34
1	10 $\mu$ F 16 V Tantalum capacitor	C92-0505-05	C39
1	.01 $\mu$ disc capacitor	CK45B1H103Z	NA



**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance from your closest Kenwood Service Center (Long Beach, CA, or Virginia Beach, VA).

Time required for this modification is 60 minutes or less.

## TS-950SD 18.115 MHz spur

Kenwood Communication, inc.

Service Bulletin no. 1052 (28 March 1994)

**Symptom:**

Transmitting on 18.1145 MHz causes a spur to appear at 18.1150 MHz with the antenna tuner on.

**Corrective Action:** Add the low pass filter shown in the accompanying diagram to the input circuit of mixer Q41 on the IF unit (X48-3060-00). This filter will increase the attenuation by approximately 20 dB.

## Parts required:

Qty	Description	New Part No.	Circuit Description
1	220 $\mu$ H inductor	L40-2211-14	NA
1	220 pF chip capacitor	CC73FSL1H221J	NA

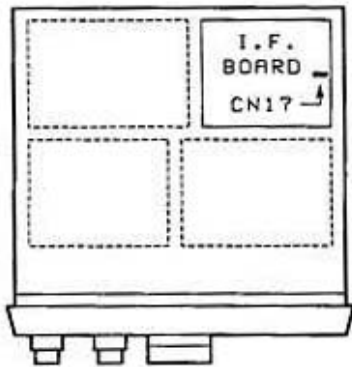


FIGURE 1

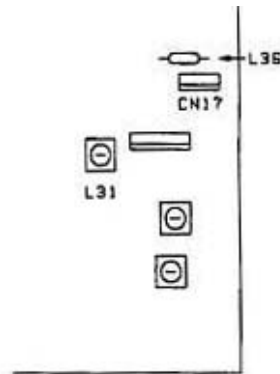


FIGURE 2

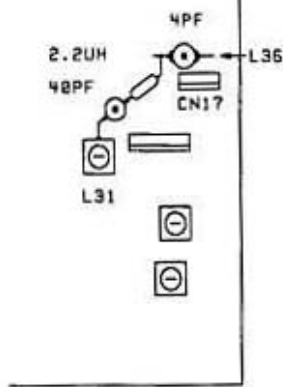
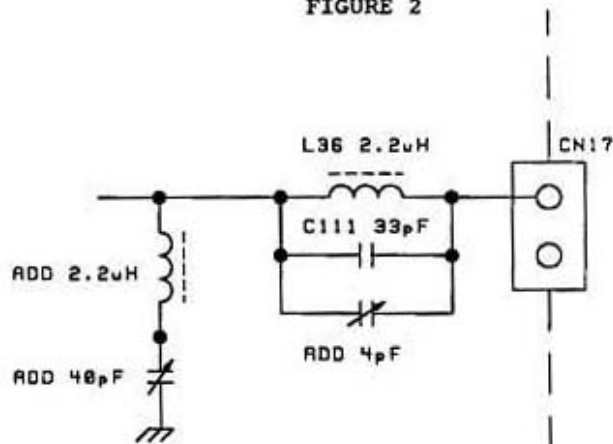


FIGURE 3



SCHEMATIC

**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance from your closest Kenwood Service Center (Long Beach, CA, or Virginia Beach, VA).

Time required for this modification is 60 minutes or less.

## TS-950SDX Change of Gate resistor type

Kenwood Communication, inc.

Service Bulletin no. 1053 (28 March 1994)

**Symptom:**

If the final amplifier is operated at excessive transmit levels (over 150 watts output) the final FET may fail and short from Source to Gate. If this occurs, the bias resistors used in this circuit may be damaged and cause a large amount of smoke to be emitted from the final compartment.

**Corrective Action:**

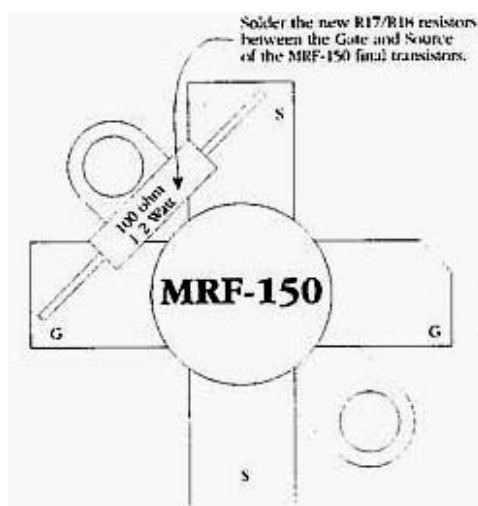
Change the carbon type resistor used for R17 and R18 to the fuse type resistors specified below. This will prevent an unpleasant odor and smoke from the final compartment.

**Parts required:**

Qty	Description	New Part No.	Circuit Description
2	100 ohm ½ watt fuse resistors	R92-1310-05	R17, R18

**Procedure:**

Remove the old resistors from their locations on the circuit board and install the new resistors directly between the Gate and Source of the final transistors. (see the illustration below).



**Caution:** This modification requires soldering equipment rated for CMOS type circuits. It also requires familiarity with surface mount soldering techniques. If you do not have the proper equipment or knowledge do not attempt this modification yourself. Seek qualified assistance from your closest Kenwood Service Center (Long Beach, CA, or Virginia Beach, VA).

Time required for this modification is 60 minutes or less.

### Countermeasure against cold solder joint at the resistor block; CP1-CP4 in the PLL unit.

**Phenomenon:**

Sub-band reception is deteriorate or receiving audio is intermittent distortion.

Transmission monitoring audio is distorted.

If you find the malfunction at stated above, take the following procedure.

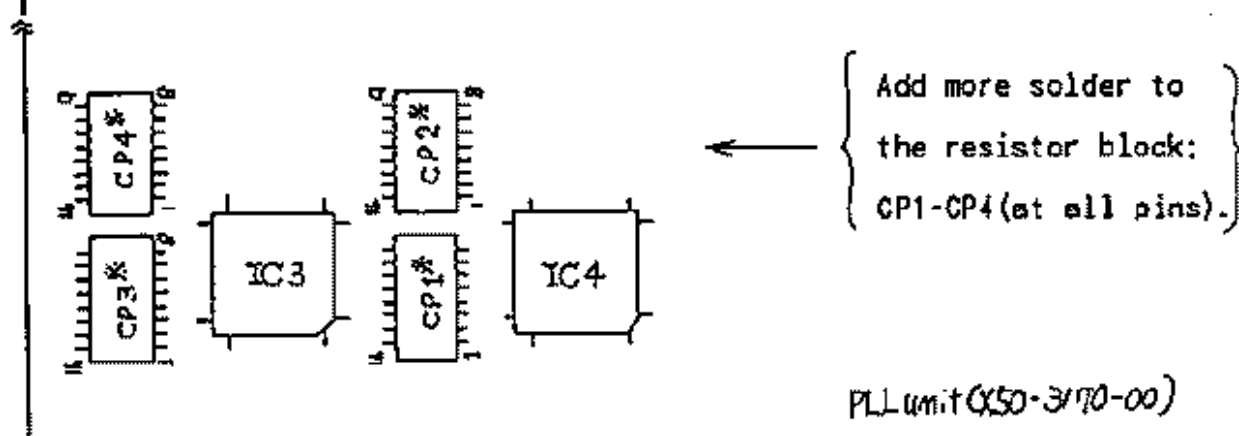
**Cause:**

Cold solder joint of resistor block; CP1-CP4 in the PLL unit (X50-3170-00). In the manufacturing process, the temperature in the reflow soldering furnace was lower than specified and the connection was insufficient.

Temporary: Add more solder to the resistor block; CP1-Cp4 (at all pins) in measure the PLL unit (X50-3170-00).

Permanent: review the whole temperature control system of the reflow furnace to manufacture the Printed Circuit Board at more adequate temperature.

PC Board (Component side view).



## Kenwood TS-950S & TS-950SD RF gain mod

*Kenwood & NOSS*

This mod is courtesy of Kenwood

The Kenwood TS-950S and TS-950SD HF transceivers are fine radios. However, many, if not all, of them were produced with a design flaw which allows the RG GAIN control to cease function in the presence of a strong signal IF the AGC has been turned OFF.

One common scenario goes something like this:

Tuning around any band, in CW mode, with the AGC turned OFF, and using the RF GAIN to control received audio level.

RF Gain is set to allow moderately strong signals (c. S-9) to be received without excessive audio output (comfortable listening level).

Tune through a strong (S-9 +10dB or more) signal. The receiver loses all control of the RF GAIN. The control becomes virtually useless you either tune off the strong signal or the signal stops, at which point the RG GAIN control again becomes usable. Immediately switching the AGC back ON, will also allow you to regain control of the RF GAIN, but if you again return to AGC OFF, and the signal is still present, control is again lost.

Although I have not tried it, I am told this problem can also occur in other receive modes as well.

The following document is a re-typed version of the Kenwood Mod. Any typos have been allowed to remain in the narrative of the document. The schematic has been re-drawn in order to allow you to follow the mod more easily, not because the original drawing was in error, but because it was somewhat difficult to follow the black & white line drawing.

I have also included several photos of the Signal Unit PC board to assist you in locating the portion of the PC board which will require your attention.

Note that you will be dealing with SMT-type devices which will require a significantly higher degree of care when working with them than would be required if non-SMT devices were used. This is result of progress(???) in manufacturing. You WILL have to use a soldering iron with a very small tip, and you may have to use a magnifying lens to assist you in locating and removing the SMT devices, not to mention installing the two jumpers required by the mod. Fortunately, NO additional components are required... only a couple lengths of #24 to #30 insulated wire (for the jumpers).

Good luck - Tom Hammond NØSS n0ss@arrl.net.MODIFICATION.NET 28 Nov 2001

## MODEL TS-950S & TS-950SD

No RF Gain at AGC OFF and large input.

### CONTENTS

### REFERENCE

Phenomena: AGC is turned OFF. The RF GAIN is set maximum in the counterclockwise direction. SSG is connected to the ANY pin. The SSG input is about 10dB $\mu$ . A signal is received on the SSB mode, and it is made sure that the S-meter's pointer swings (about S-3). The RF GAIN control is turned counterclockwise to set the S meter's swing to S-9. The SSG input is changed from 10dB $\mu$  to 40dB $\mu$ . Then, the S meter reading zero, and the RF GAIN becomes disabled.

Cause: Insufficient study on switching transistors Q 30 and Q 40 (these transistors operate at AGC OFF) of AGC amplifier Q 10 in the signal unit.

Countermeasure: The circuit of the AGC amplifier Q 10 is the signal unit (X57-3380-00) is modified.

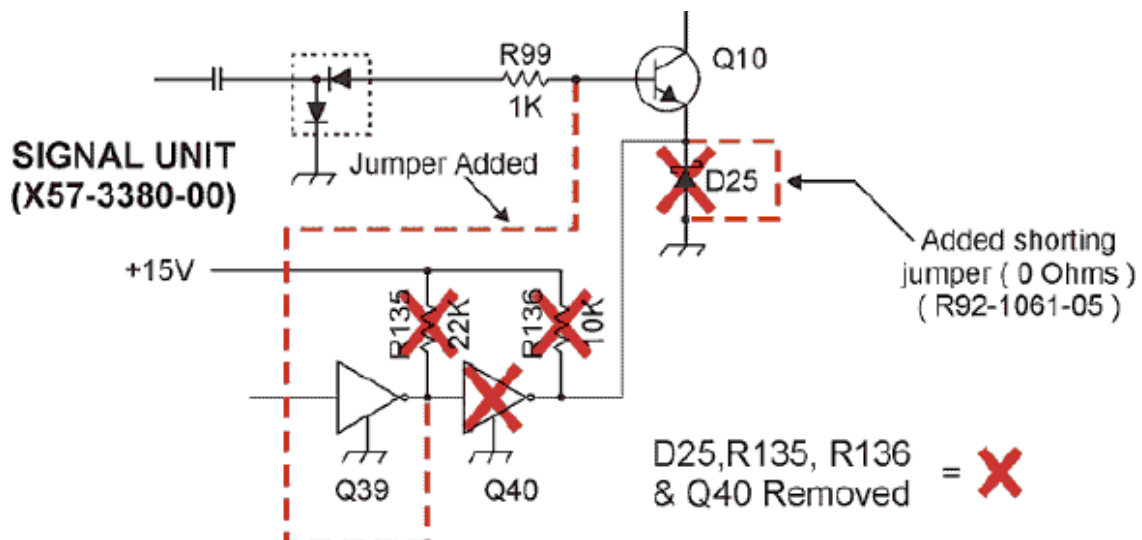
Chip resistor R 135, it removed.

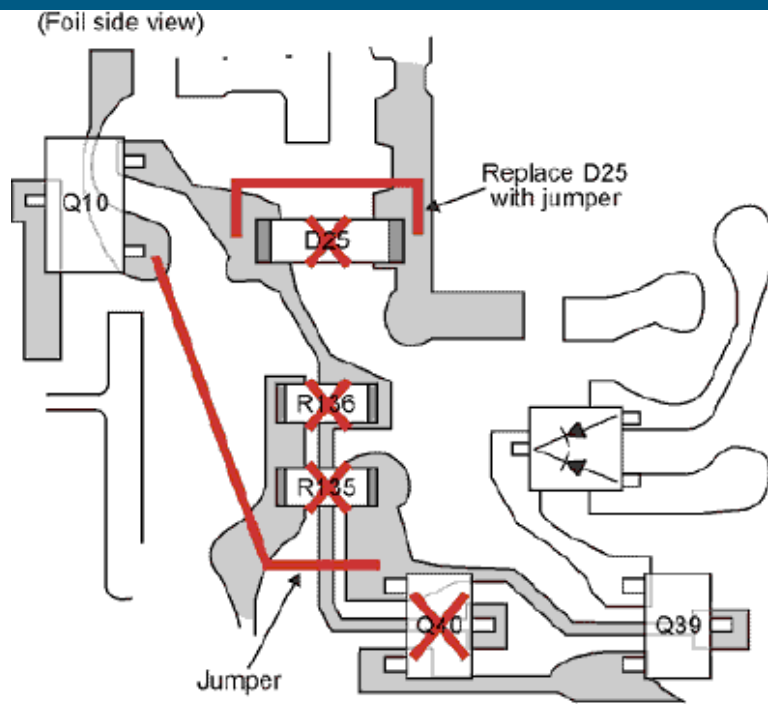
Chip resistor R 136, is removed.

Digital transistor Q 40, DTC124EK, is removed.

Chip diode D25, RKZJ3.6B, is changed to chip jumper W8,( R92-0679-05 ).

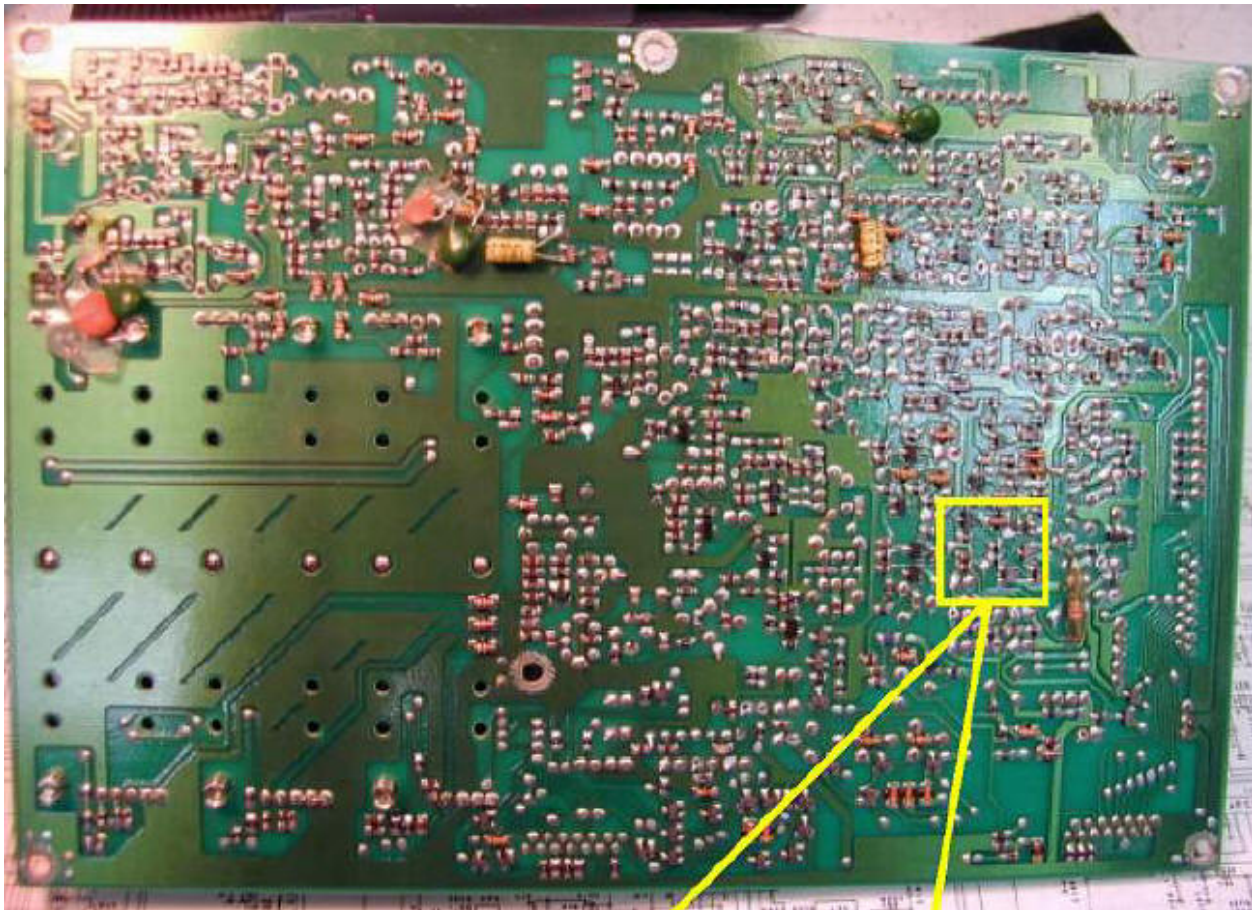
Short jumper W9, R92-1061-05, is added.



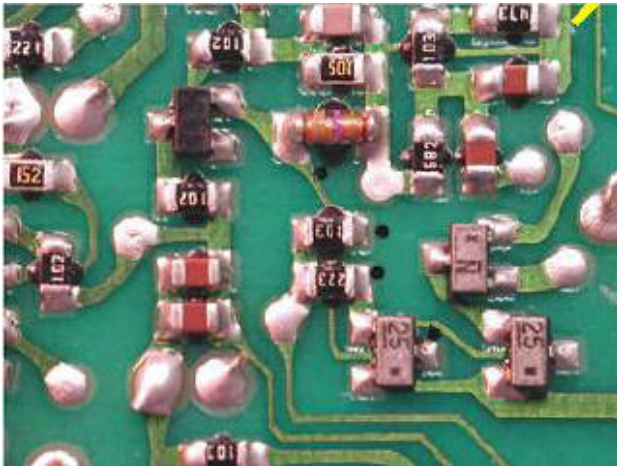


D25, R135, R136 = X  
& Q40 Removed = X

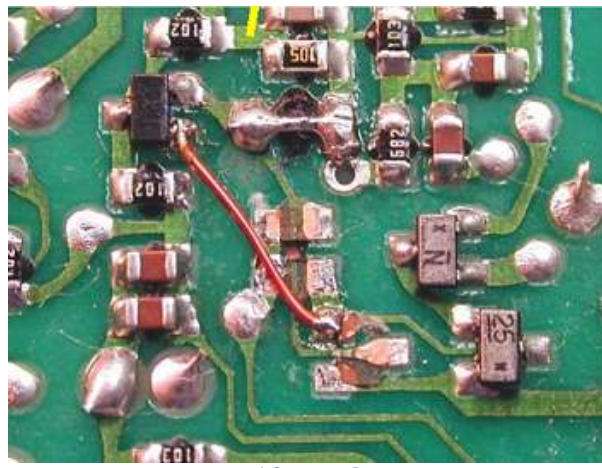
Diagram redrawn for clarity  
by: Tom Hammond NØSS  
28 November 2001



Signal unit pc board (X57-3380-00), Bottom OF TS-950SD



Before mod



After mod

This modification can also be [download](#) (820 Kb) as a PDF file by [Tom Hammond NØSS](#)

### Implementation of the K6XX QSK Waveform Mod in the TS-950SD

Tom Hammond NØSS - [n0ss@earthlink.net](mailto:n0ss@earthlink.net).

by: Tom Hammond NØSS

Bob Wolbert (K6XX) has come up with a really great modification to improve the CW waveform and character weighting in a number of commercially-made Amateur Radio transceivers. The original article on the mod, and a separate article containing a PC board design with which to implement it, are available at <http://www.k6xx.com/ikanrite.html>.

This article describes the specific steps required to implement this mod in the Kenwood TS-950SD, and assumes that the PC board design referenced above has been used to produce a PC board, and that the PC board has been populated with the required components.

**READ THESE INSTRUCTIONS COMPLETELY BEFORE YOU HEAT UP THE SOLDERING IRON.**

**REFER TO THE SCHEMATICS IN YOUR TS-950xx MANUAL TO CONFIRM ALL CONNECTIONS BEFORE YOU ATTACH ANY WIRES TO A PC BOARD.**

#### Step-by-Step Installation steps

Remove the top and bottom covers of the TS-950SD and set them aside. Don't forget to disconnect the two cables from the DSP unit before removing the bottom cover of the radio.

Place a protective 'blanket' or other soft material beneath the front of the TS-950SD, so that when the radio is moved and turned, you will not damage the finish on the plastic portion of the front panel.

On each sides of the TS-950SD chassis, just behind the front panel, you will find two Phillips-head screws which hold the front panel in place. The bottommost of the two screws, when loosened 2-3 turns, acts as a hinge for that side of the front panel, allowing it to first slide forward about 1-1/2 inches and then to tilt forward to expose the back of the front panel and the front of the sub-front panel PC boards mounted to the main chassis. The topmost of the two screws may be completely removed to allow the front panel to move. Loosen the bottom screws, remove the top screws and slide the front panel forward.

## TS-950SD With Front Panel Hinged Out

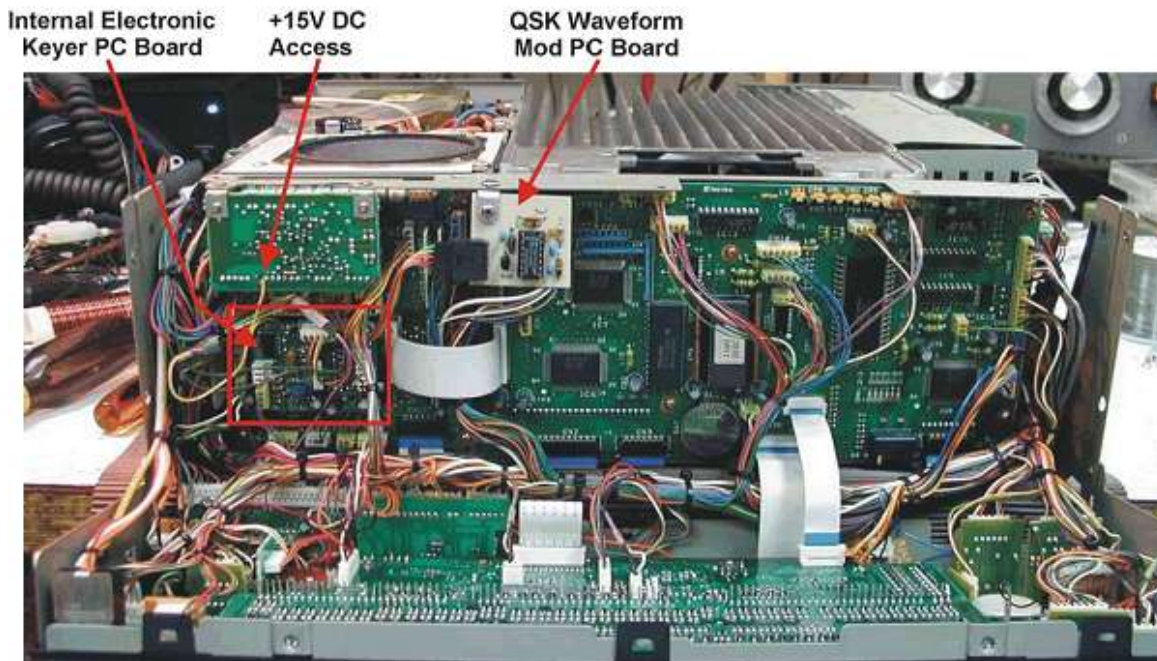


Figure 1

IN THE STEP WHICH FOLLOWS, BE CAREFUL TO NOT ALLOW THE FRONT PANEL TO 'FLOP' DOWN IN AN UNCONTROLLED MANNER. Should this happen, one or both of the thin white ribbon cables just to the right of center in Figure 1 may become unplugged and will require reinstallation. In this case, you must CAREFULLY pry out on the locking tabs which hold the locking mechanism of the socket and then lift the mechanism about 1/4" in order to be able to re-insert the ribbon cable. Once the cable is reinserted, press the locking mechanism back into place.

Slide the entire radio forward, such that the front of the radio extends off the front edge of the work surface, allowing the front panel to rotate from its normal vertical position to a horizontal position. If necessary, take steps to support the front panel at an angle no greater than 90° to the vertical.

Prepare a 6" length of 5-conductor cable to attach to the 5-pin connector on the PC board. Note that the wires for the GND, QSK, and Key Out lines will be connected to the BACK side of the TS-950SD internal Keyer PC board, while the +V and the Key In pins of the 5-pin connector must be connected to other off-board devices. As such, the +V and the Key In wires should be cut to 3"-4" and terminated with single-pin receptacles or pins. AMP AmpModu 0.25" pins, receptacles, and housings (Mouser 571-1021073, 571-875236, and 571-7874992) work well for this task. Use a single-pin receptacle and housing on the AUX Key In lead, and a single pin (insulated with heat-shrink-tubing) on the +V lead. The mating connections will be used on the leads coming from the external sources. Note that I added a slightly larger diameter heat-shrink tubing 'cover' to provide additional protection for the single pin connection, allowing the heatshrink tubing to slip over the single-pin housing, thus protecting the single pin lead when it is not inserted into the mating single-pin housing receptacle. This added protection can be seen in the photo above, connected to the pink wire, in the lower left quadrant of the picture. See a better example a bit later in this article when the connection of the AUX Key Input is connected to the

## QSK Waveform Mod PC Board Mounting Detail



Figure 2

connection, allowing the heatshrink tubing to slip over the single-pin housing, thus protecting the single pin lead when it is not inserted into the mating single-pin housing receptacle. This added protection can be seen in the photo above, connected to the pink wire, in the lower left quadrant of the picture. See a better example a bit later in this article when the connection of the AUX Key Input is connected to the



ACC2 connector.

Mount the QSK mod PC board to the underside of the top lip of the chassis front, as shown in Figure 2 above, and in Figure 1, on the first page of this document.

To a 26" length of small diameter (#22-#24) insulated wire, attach a single pin, and insulate it in the manner described above, including the oversized heatshrink cover for the housing into which it will plug. Attach this connector to the mating single-pin housing/receptacle coming from the AUX Key In lead of QSK Mod PC board.

Carefully, run the free end of the 28" length of wire between the back of the front panel and the front of the facing PC boards, out the bottom of the TS-950SD.

Carefully fold up front panel, slide it into place, and secure it in place with the two TOP screws. There is no need to tighten the hinge screws at this time.

Carefully invert the TS-950 and turn it so the rear of the radio is now facing the front of your work surface.

Refer to Figure 3, and route the free end of the Key In lead along the side of the chassis, to the rear of the chassis. As you pass the tie-wraps which secure the other wires into bundles, take time to pass this Key In lead through the tie-wraps as well.

When the AUX Key In lead has been properly routed, lay it just inside the back edge of the chassis, measure the length required to attach this lead to pin 2 of the ACC2 connector (see Figure 4). SUBTRACT two inches (2") from the measured length and cut off any excess wire length. To this end, attach a single-pin receptacle and slip it into a single-pin header.

Attach a .001uF (50V min.) cap between pins 2 & 4 of the ACC2 jack as shown in Figure 4.

From the excess wire cut in step 13, measure and cut a 3" length. Strip 1/8" of insulation from both ends and tin them. On one end, install a Figure 4 single-pin receptacle and slip it into a single-pin housing. Solder the other end of this wire to pin 2 of the ACC2, on the back side of the jack.

To the unterminated end of the AUX Key In lead coming from the front panel, install a single pin and insulate it with heatshrink tubing. Note that the heatshrink tubing is only shrunk at ONE END, the end covering the pin itself is NOT shrunk, to allow insertion of the pin into the mating single-pin housing.

Turn the TS-950SD back around, so the front panel is facing the front of the work surface and tilt the front panel to the horizontal position.

Refer to Figure 1 and locate the internal keyer PC board. This PC board is not screw-mounted. It plugs onto two header blocks attached to the PC board in back of it. To access the keyer PC board, carefully, rock it back and forth as you pull it away from the larger PC board.

The keyer PC board has two (2) multi-wire header connectors attached to it. Carefully remove both of the multi-wire header connectors.

Turn the keyer PC board so it's back (foil) side faces you.



Figure 3



Pin2 GND Back side of ACC2 Connector AUX Key Line Conn  
Figure 4

Refer to Figure 5. At the bottom of the keyer PC board, there are six (6) pads, each immediately above a matching hole (for the header plug pins). In the following step, pin numbering will begin with the leftmost of these six pads and progress to the right. Wires will be connected to pins 2, 3, & 6, respectively.

Remove 1/8" (max.) of insulation from the three unterminated leads coming from the QSK mod PC board, tin the leads (note: the insulation may recede as the ends are tinned) and clip the tinned leads to a length of 1/8"

Attach the wire from pin 1 (Key Out) on the QSK Mod PC board to pin 2 on the keyer PC board. BE SURE to attach the lead so the rest of the wire faces the INSIDE of the PC board.

Attach the wire from pin 2 (QSK/Full) on the QSK Mod PC board to pin 3 on the keyer PC board.

Attach the wire from pin 5 (GND) on the QSK Mod PC board to pin 6 on the keyer PC board.

Position the keyer PC board so that it can be reinstalled onto the header blocks on its motherboard. Arrange the wires from the QSK mod PC board such that they are well clear of the header holes on the (now) right side of the keyer board, and so they exit from the top rear of the QSK mod PC board. Reinstall the keyer PC board.

Reinstall the two multi-wire header plugs removed from the keyer PC board in step 19, above.

Cut a 3" piece of insulated wire (preferably the same color and type of wire as used for the +15VDC (+V) lead coming from the QSK mod PC board 5-pin connector. Strip 1/8" of insulation from each end of this wire and tin both ends. To one end of this wire, attach a single-pin receptacle and insert it into a single-pin housing. This will mate with the single pin plug which was created in step 6 of the instructions.

Attach the unterminated end of this wire to the +15VDC pad on the PC board immediately above the keyer PC board, see Figures 1 & 6 for the location of the PC board and for the proper pad to connect to. Also, **confirm** this connection in your TS-950 manual (schematic section).

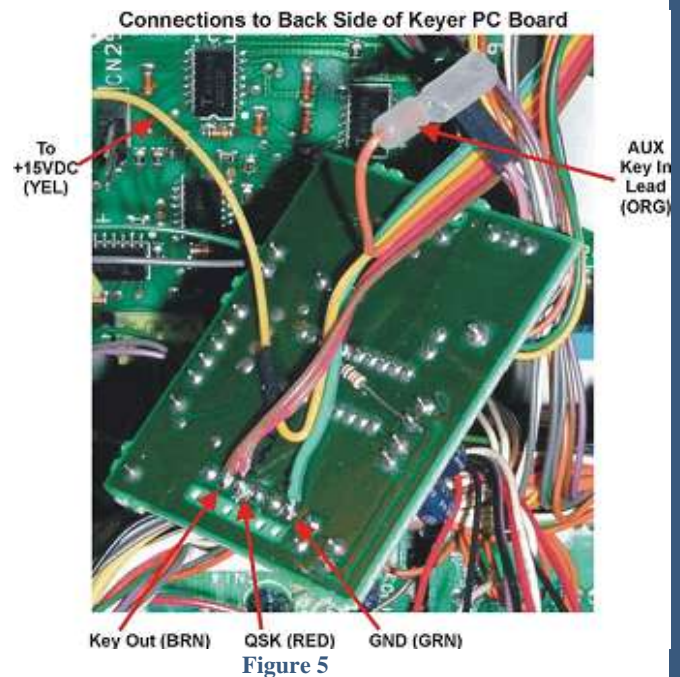
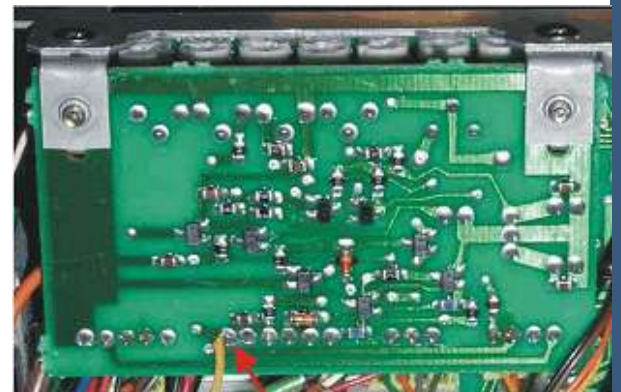


Figure 5



+15VDC Pwr Conn, to Board Immediately Above Keyer PCB  
Figure 6

Connect all of the single-pin connectors to their respective pins (+15VDC, and two connections Figure 6 (front & rear) of the AUX Key In line).

This should complete installation of the QSK Waveform Mod. However, you will still need to tweak the component values for CV and RT, and possibly CT as well. With any luck at all, you won't have to change the value of CT however.

If you installed a 1-Meg PC-mount trimmer pot at RT, skip **to step 33**.

Temporarily detach the QSK mod PC board from its mounting and tack-solder two 1" leads into the holes reserved for RT and attach a 1-Meg potentiometer (to be referred to as RT during the testing period) to these leads. Reinstall the PC board.

Place a 1/4" stereo plug into the KEY jack (not the AUX Key In connection at ACC2) on the rear of the TS-950. You will NOT be able to send CW via the AUX Key In connection unless the regular KEY jack has a plug in it.

Run the TS-950 output coax run to a dummy load though a monitor scope (or attached to an oscilloscope).

Connect the output of your EXTERNAL CW keyer to the AUX Key Input at ACC2 pin 2 and ground. You may need to use clip leads for this connection until you fabricate a jack to plug into ACC2 pin 2.

Turn the TS-950 on and set the POWER control fully CCW. Set the VOX/PTT switch to VOX, and FULL/SEMI (QSK) to SEMI.

Set the external keyer speed to around 30 WPM and the weighting to 50%.

Send a string of DITs and slowly increase the POWER output control until an output envelope is shown on the monitor scope.

While watching the CW waveform on the scope, adjust the Horizontal Sweep speed of the scope in order to stop two consecutive DITs on the screen.

HINT: Increase the speed of the Horizontal Sweep, to the point that one DIT wraps itself around the trace and you can then superimpose the BREAK of this DIT on top of the MAKE of the same DIT. There will be a bright line through the trace, but you will be able to easily tell if the weighting is correct because a 50% weighting will cause the BREAK to end just as the MAKE begins. If they overlap, then the weighting is too heavy. If they don't touch, then it's too light.

If the weighting in this mode (SEMI BREAK-IN) is too light, increase the value of CV, if it is too heavy, reduce the value of CV a bit, until you obtain a weighting ratio of approximately 50%.

Set the FULL/SEMI switch to FULL.

While sending a string of DITs, adjust the value of RT until the space between the end of one DIT and the start of the next DIT is the same length as the length of the DIT itself.

Once you have successfully set the weighting, you are finished.

If you did not use a PC-mount pot for RT, you must now remove the temporary pot (and leads), measure the value of the pot, and replace it with a fixed resistor of the same approximate value.

If required, reinstall the QSK mod PC board.

Tilt the front panel back into place (vertical), slide it back toward the main chassis, and secure it in place with two screws at the top, on each side. Retighten (until snug only) the two hinge screws. Replace the top and bottom covers of the radio and reattach the two cables from the DSP unit on the bottom of the radio.

You are done! Whew!

Please note. This document would not have been possible without the assistance of Bob Wolbert (K6XX) who designed the original modification.

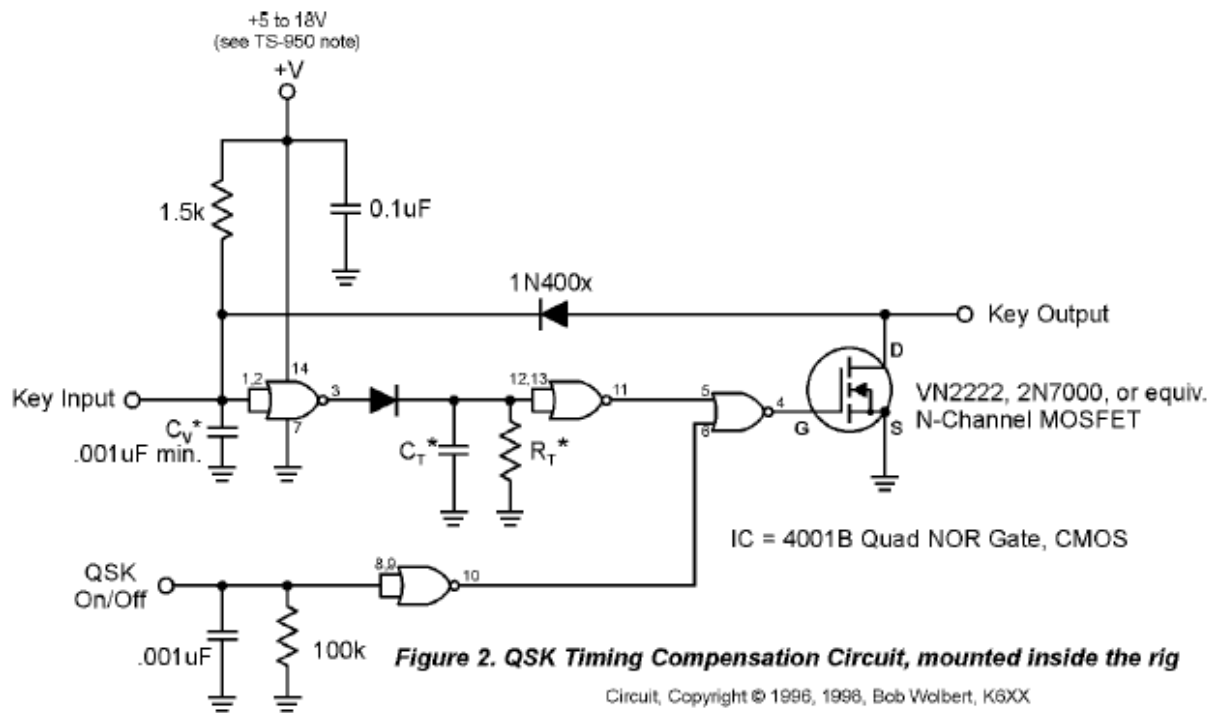
If you find errors in this document, please contact me so that I may make corrections to the instructions.

Revised: 13 April, 2001

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## Better QSK Waveforms

by: Bob Wolbert, KM



### Capacitors, Connector(s) & Notes

- .001 uF monolithic - Mouser 21 RX510
- .02uF monolithic - Mouser 21 XR420
- 0.1 uF monolithic - Mouser 21 XR310

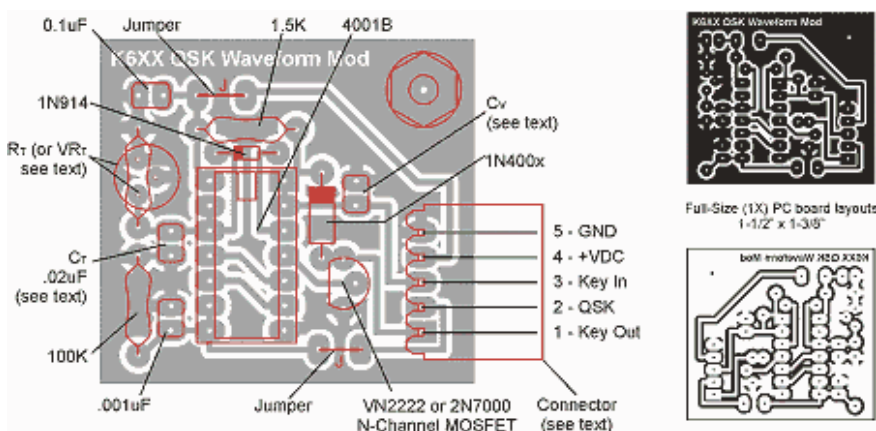
**TS-950 users note:** You *must* connect to a +15VDC supply line, rather than to a +5VDC line. Otherwise, the VOX/T-R line may trigger falsely. This mod must be used with an AUX Key input (see: <http://www.k6xx.com/radio/auxkeyin.pdf>). Finally, this mod will NOT function in the TS950 series unless a 1/4" stereo phone plug (empty or otherwise) is installed in the KEY jack on the back panel of the radio.

(Optional) 5-Pin .025" Rt-Angle PC-Mtg Shrouded (male) Header connector, Mouser 571-1033613, mating plug is with Mouser 571-1022413 (this mating plug, requires five 571-875236 female receptacles).

You may find it helpful to have a couple single-pin connectors for the DC and the KEY IN lines as well. Mouser 571-7874992 single-pin housings (with 571-875236 receptacles) mate with 571-1021073 push-in pin or with a single pin from Mouser 517-6111 TN.

\* Starting value, Cv & Ct must be found by trial and error. Start with .001 uF at Cv and increase if non-QSK keying needs to be heavier.

For Ct, start with .02uF-.022uF and about 500k for Rt. Or use a 1 M pot at Rt and adjust it until the proper weighting is achieved. Then replace the pot with a fixed resistor of equal value. Note that pads are also provided for a permanently mounted trimpot (Mouser 72-T7RYB-1 M or 594-75H-1 M), if you wish to replace Rt with a variable device altogether.



**Foil-Side of PC board, showing X-Ray view of component placement. All components mount on the NON-FOIL side of board.**

PC board design by: Tom Hammond, NOSS 03/18/2001

This modification can also be [download](#) (2.5 Mb) as a PDF file by Tom Hammond NOSS

### TS-950 SO2 Adjust

*Dave, W6NL/HC8L - [leeson@earthlink.net](mailto:leeson@earthlink.net).*

The TS-950SDs I have use the Kenwood TCXO SO2. They have both drifted off frequency enough to notice, so I wanted to reset the master oscillators.

The frequency adjustment is under the TCXO label (under the "N" in Kenwood). I peeled back the label, and the adjustment was simple. I tune in WWV at frequency = 20.000 MHz, mode = AM, filters = 6 kHz, marker = on.

You can hear the beat note and adjust for zero beat. I assume I'm the only one that didn't know about this!

73 de Dave, W6NL/HC8L

### Using Subreceiver to Improve TS-950 Noise Blanker

*Dave Leeson, W6NL/HC8L - [leeson@earthlink.net](mailto:leeson@earthlink.net).*

I was searching for a way to blank ac line noise without getting the distortion and intermodulation you get when you use the typical transceiver noise blanker. I was researching Collins 316B-2 (uses 40 MHz noise receiver) and ac line-synchronous blankers and was looking at the TS-950 blanker circuit to see how it was implemented when I realized that either the main or sub receiver can trigger the NB diodes for both receivers. So this meant I could use the sub receiver to get the noise signal, and it could be tuned to a quiet part of the band (or even out of band).

By inspection of the circuit diagrams in the service manual, it appears that the noise blanker function can be driven by either the main or sub receiver signal, but that in either case the blanking is applied to both paths. So one can turn on the sub receiver, tune it to a quiet spot in or out of the active band, and use the sub receiver blanking control rather than the main blanking control to get impulse blanking without distortion or intermodulation from in-band signals.

To set up:

NB1 = ON  
Main NB = minimum (full CCW)  
Sub NB = set for blanking  
Sub RX = ON  
Sub RX frequency = out of band

This results in quiet, intermod free blanking.

The only problem seems to be a limitation on the spacing between the main and sub receiver frequencies of 500 kHz maximum, but this isn't a big issue. You can listen to the sub receiver output to confirm that there isn't an interfering signal there.

For information on powerful ac line-synchronous blankers, see

[http://www.ussc.com/~turner/syn\\_blank.html](http://www.ussc.com/~turner/syn_blank.html) [http://www.ussc.com/~turner/syn\\_blank.html](http://www.ussc.com/~turner/syn_blank.html)

<http://www.ussc.com/~turner/BLANKER1.GIF> <http://www.ussc.com/~turner/BLANKER1.GIF>

<http://www.lwca.org/library/articles/jtreed/gate/gate1b.htm> <http://www.lwca.org/library/articles/jtreed/gate/gate1b.htm>

These are blankers that use the AC line itself to set phase and blanking width, and are used with VLF receivers where line noise can be a big problem.

**ATTENTION**

The KB2LJJ takes no responsibility for any damage during the modification or for any wrong information made on this modification.