

(Author: Dave Phillips, KB7JS. Copyrighted)

Kenwood TS-930 Service Manual

Adjustment Procedures

Corrections, Notes, and Hints

The adjustment procedures documented in the Kenwood Tzs-930 service Manual include several instances of incorrect or confusing data. The following hints may be useful in performing the adjustments.

Voltage Adjustment

- Step 2 (3) specifies adjusting VR13 to set the TX Control Reference voltage to 3.20V (+/- .01V). The test point identified is Jumper J89.

Jumper J89 is the correct test point only on the Old Signal Unit. All of the Jumpers were renumbered on the New Signal Unit. In fact, this particular jumper no longer exists on the updated Signal Unit

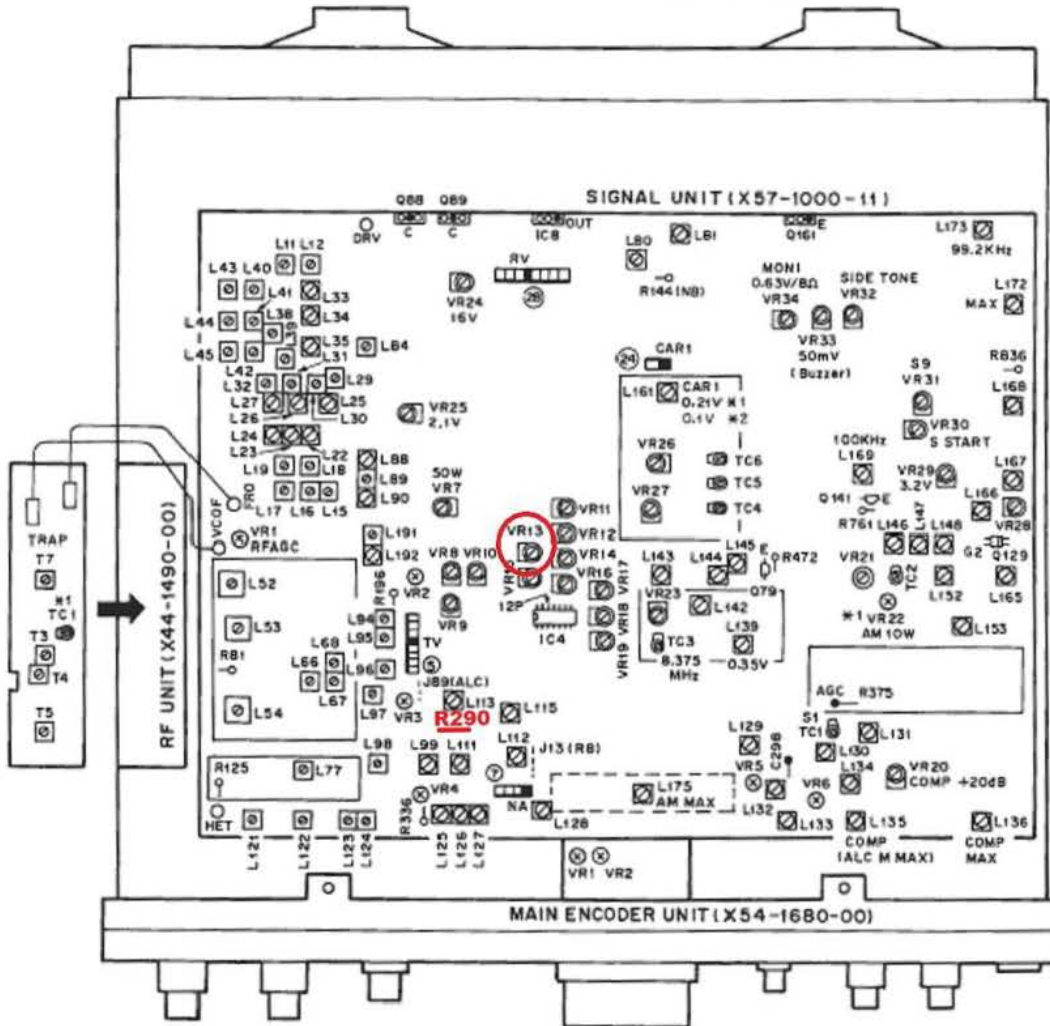
- A better test point for this adjustment can be easily located on both models of the Signal Unit at R290, located just to the right and below VR3, the ALC adjustment pot, lower left quadrant of the SU looking from the front of the radio. See the following diagrams.

VOLTAGE ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. Voltage	1) POWER : ON RF GAIN : MAX (Full CW) MODE : USB STBY : REC	DC V.M	AVR	28B	AVR	VR1	28.5V	± 0.3V
			SIG-NAL	Connector 28-RV	SIG-NAL	VR24	16.0V	± 0.1V
						VR29	3.20V	± 0.01V
						VR25	2.20V	± 0.01V
2. TX Control voltage	1) STBY : REC	DC V.M	SIG-NAL	Connector 5-TV		Check	Less than -0.8V	
	2) STBY : SEND					Check	16.0V ± 0.3V	
	3) STBY : SEND				R290	SIG-NAL	VR13	3.20V
3. SWR standard voltage	1) STBY : REC	DC V.M	SIG-NAL	IC4-12	SIG-NAL	VR15	0.5V	± 0.01V This is a reference level for the SWR circuitry. It will effect the auto antenna tuner.

BOTTOM VIEW

* 1 : From S/N208XXX-309XXX
* 2 : From S/N310XXX-



RX Adjustment

CAR1 & CAR2 Adjustments

These procedures set the base frequency alignment of the CAR1 and CAR2 carrier oscillators, which form the signal mix basis for the 2nd IF.

It is important to understand how the CAR1 and CAR2 oscillator frequencies affect the IF passband. The output of the 2nd Mixer is 8.83 MHz, which becomes the 2nd IF frequency.

This procedure is part of the initial receiver adjustment, performed with the default preset conditions specified at the beginning of the Adjustment procedures section. Specifically, the SSB Slope Tune controls must be set to TUNE LOW to MIN, TUNE HIGH to MAX. Failure to ensure these settings will really screw up the adjustment of VAR1 oscillators since the SSB Slope Tune shifts the CAR1 and CAR2 frequencies.

Even with the SSB Slope Tune controls set correctly, I have often encountered radios where this adjustment is not possible as component aging of the crystals and pF caps in the oscillator stages cause shifting from the original spec frequency and the CAR1 and/or CAR2 crystal adjustments do not have sufficient range to allow them to be set at their correct frequencies.

CAR2 is mixed with CAR1 to generate the 3rd IF at 455 kHz at Q78. You can offset CAR2 to help harmonize this mix, the idea is to ensure that this IF generates the correct 455kHz offsets for each mode (e.g. 455.0 kHz for CW, 456.5 kHz for USB, 463.5 kHz for LSB).

Keep in mind that CAR2 is also directly used by the 1st TX mixer, so this adjustment shifts the TX IF away from the center passband of the 2nd IF filters (8.83MHz) stage as well. This won't be noticed until you attempt to adjust the SSB Frequency Response in the TX adjustment procedures, which changes the CAR1 offsets again to harmonize the TX envelope, and too much offset here can destabilize the performance of the receiver.

A better approach is to remove the Signal Unit and replace the cap's in the oscillator stages to allow more latitude in their adjustment and get them on their specified frequencies. Typically, 30% - 50% reduction in capacitance will allow the oscillators to "pull" the crystal to the correct frequency (e.g. 22pF down to 10 pF in CAR1, 33pF down to 15pF in CAR2). High tolerance cap's (e.g. NPO, COG) are a must.

SSB Slope Tune Adjustment

The point of the adjustment is to adjust the CAR2 oscillator, TC3, to the center of the IF Filter Passband. This adjustment step is basically nonsense.

- Required equipment for this test is stated as “VBT-1” and an Oscilloscope. WTH is a VBT-1? Unknown, undefined in the SM, or anywhere else I have searched.

Based on the intent of the procedure, I would have to guess that this “device’ provides a two-tone modulated RF signal at approximately -50 dBm. No specification is provided on the how to adjust this device to obtain the appropriate modulation bandwidth, the adjustment simply says adjust to obtain a balanced “Eggs on a Rope” waveform. This is subjective since the IF filter bandwidth of the TS-930 changed with Old/New versions of the SU (300-2700 Hz versus 300-2900 Hz).

- The connection points are noted as “UNIT – SIGNAL, Rear Panel”, and “Connector J7, 1P, IF OUT”. The SM convention are these are in order with the Test Equipment list, and would then indicate that the mysterious VBT-1 would be connected to the “Rear Panel” on the Rear Panel, and the O-Scope would be connected to “Connector 7, Pin 1”.

This makes no sense. Connector 7 Pin 1 is actually the Noise Blanker Gate (NG1), from the center tap on L128, which is after the second RF mixer. This is the 8.83Mhz IF signal path, after the mix of the 1st IF (44.93 MHz) and HET (36.1 MHz) at Q62/Q63.

Still, there is more to the fallacy of this procedure.

- The procedure also requires the insertion of a set-up Jig in the place of the CW Narrow filter. This jig essentially bridges the CW filter path to “simulate” it. A schematic of the Jig is provided, but the schematic is referenced from the PC Trace (bottom) side of the Signal Unit, so is completely backwards from the connection points on the top of the board.
- The procedure specifies the adjustment of TC3, the CAR2 Oscillator, to achieve the balanced “Eggs on a Rope” scope image typical for a SSB IF signal. However, CAR2 is not mixed with the 2nd IF until the next stage. Q65/Q66. If the signal is sampled at Connector 7, Pin 1, adjusting CAR2, which is the 8.8375 MHz 3rd IF, the CAR2 change will have absolutely no visible effect.

I suspect the intent here is to actually insert a two-tone modulated signal generated by the VBT-1 at the second IF ahead of the 2nd mixer, so Connector 7 Pin 1 would be a reasonable insertion point, although the same effect could be achieved by inserting a RF signal at the rear panel RF connector, unless the output of the VBT-1 is actually at the 1st IF frequency. So, perhaps the test connection points are actually reversed, in which case the VBT-1 signal could be input at Connector 7, Pin 1 to mimic the 1st IF signal at 44.93 Mhz, and the O-Scope could sample the IF OUT port at the rear panel, which is the 100 kHz 4th IF.

Maybe.....

All this is required to fiddle with TC3, the frequency adjustment for the CAR2 oscillator. CAR2 is mixed with the CAR1 oscillators at Q78 to ensure the appropriate IF passband offset for each mode, and the CAR1 crystals will be fine-tuned in the SSB Mode Frequency Response in step 15 in the TX adjustment section to achieve the proper balance through the IF filter path.

CONCLUSION: CAR2 really should be set to 8.3750 MHz in Step 2 of the RX adjustment procedures, and left alone after that.