EKCO SW86 mods

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The aim of a radio restoration is usually to restore the set to working order, without modifying the original circuit. This preserves the authenticity of the original sound, and the performance is acceptable in most cases. However, there are some radios with design flaws which result in unacceptably poor performance, and in these cases the restorer may choose to sacrifice authenticity in order to achieve acceptable performance. There may be some who regard any circuit modifications to a vintage radio as an act of sacrilegeous vandalism, and not wishing to cause the slightest offence to such readers, we advise them to skip the rest of this article.

Made in 1936, the EKCO SW86 with its elegant bakelite cabinet designed by Serge Chemayeff, is one of the most beautiful art deco radios. Peter Lankshear has written extensively about its circuitry. In 1984, he pointed out some flaws in the circuit design and suggested modifications to improve performance (NZVRS Bulletin Vol. 5 no. 1 p6 and Vol. 5 no. 2 p8), and revisited these points in more detail in a later paper ('An Antipodean Ekco', Radio Bygones, Christmas 1993, p27). Lankshear remarked that the SW86 has "the potential to be a fine receiver, but it is spoiled by the AGC circuitry having about the worst design the writer has ever seen! The result should be required study for all students of AGC design as a 'spot the errors' exercise!". Recently we have tested additional modifications, and this article is intended to combine all these modifications in a single document.

The original circuit has the following problems:

1. The RF valve V1 (6D6) has fixed bias, with no AGC voltage applied. With an uncontrolled RF stage overload readily occurs, and the designers evidently found it necessary to bias back the 6D6 RF valve with an additional 1500Ω cathode resistor (R2). The cathode bias resistor is switched between 325Ω (bias -3V) for the SW bands, and 1825Ω (bias approx. -8V) for the BC band. The overall result is poor BC band sensitivity.
2. The mixer valve V2 (6C6) is a sharp cutoff pentode, an unsuitable type of valve for AGC bias control, which requires a variable-mu valve. The 6C6 is operated with a grid bias of around -5V (no signal), close to its cutoff grid voltage (-7V). The 6C6 receives 58% of the generated AGC voltage and as a result strong signals can cause complete signal cutoff (this has been observed in at least 1 set).
3. There is no AGC delay voltage, as the AGC diode load is returned to the 75 cathode, not to earth.
4. The signal diode RF filter comprises a single 500pF capacitor (C34) instead of the usual RF filter network. This may not be optimal for reproduction of high audio frequencies.

Suggested modifications

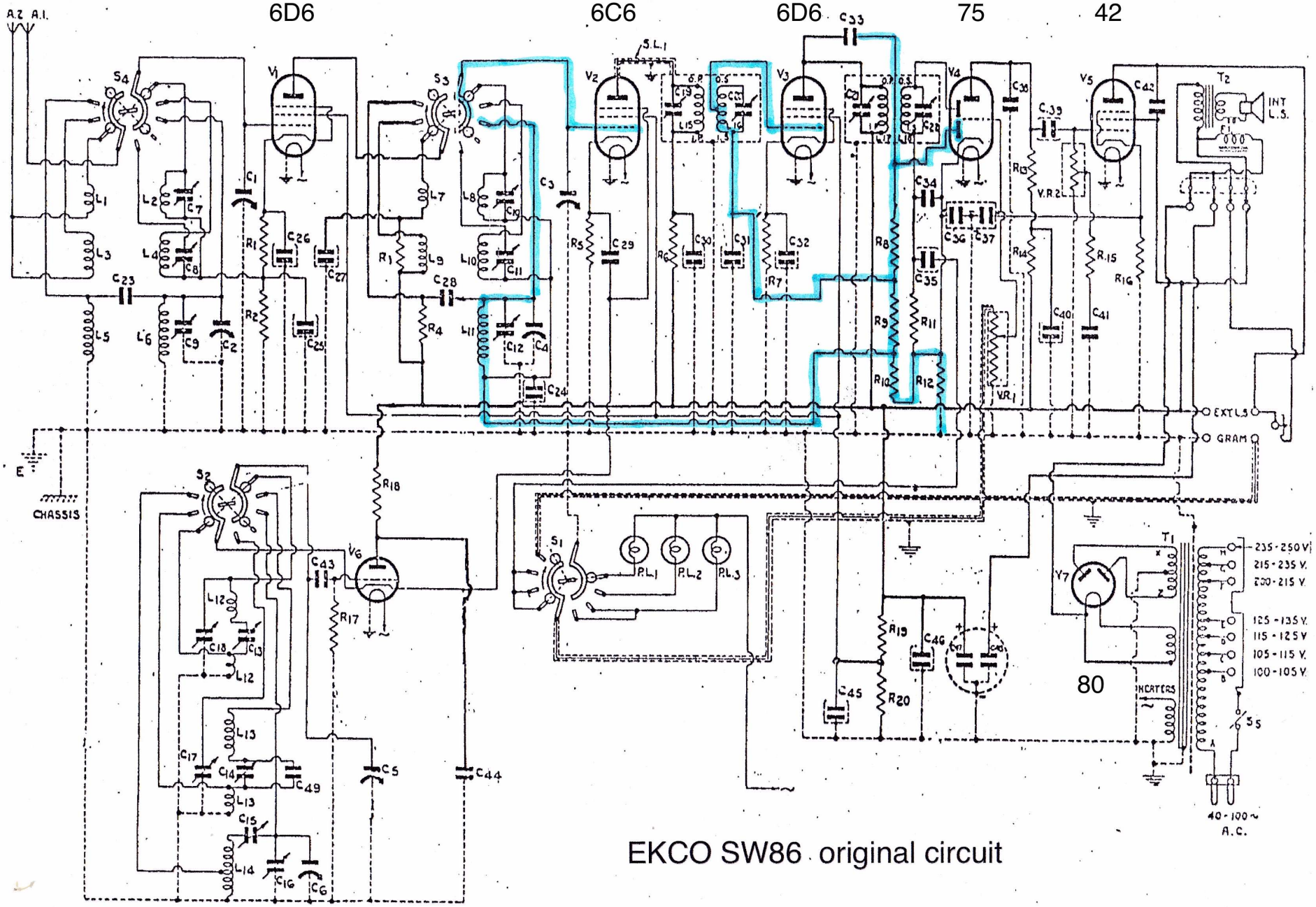
1. Remove AGC from the 6C6 by disconnecting the bottom end of L11 from R9/R10, and connecting it to earth. (C24 is now redundant but can be left in situ, thankfully, as it is cleverly buried under the wave band switch).
2. Replace R8, R9 and R10 in the AGC circuit with a single 1MΩ resistor (Ra) as the new AGC diode load, which is returned to earth, (thereby applying a delay voltage to the AGC line). Connect a 2 MΩ resistor (Rb) between C31 and Ra.

3. Add AGC bias to V1 as follows:
   a) Disconnect the bottom of L2 (call this point X) from C25/R1/R2.
   b) Disconnect the bottom of L6 from earth, and connect it to X.
   c) Connect a 0.05μF capacitor (Cb) between X and earth.
   d) Connect a 2MΩ resistor (Rc) between X and Ra.
4. Replace R1 and R2 with a single 470Ω resistor to decrease the excessive bias on V1 and improve sensitivity on the BC band. Discard C25 which is now redundant.
5. Replace C34 (500pF) with a 100pF capacitor, and add a 56K resistor (Rd) and a second 100pF capacitor (Ca) to form a proper RF filter in the signal diode circuit.
6. Replace R11 (signal diode load) with 250KΩ, and replace the volume control pot VR1 with a 1 MΩ pot. These measures are intended to prevent distortion at high modulation levels due to AC shunting of the audio signal (see MG Scroggie, Foundations of Wireless, 7th ed., p223).

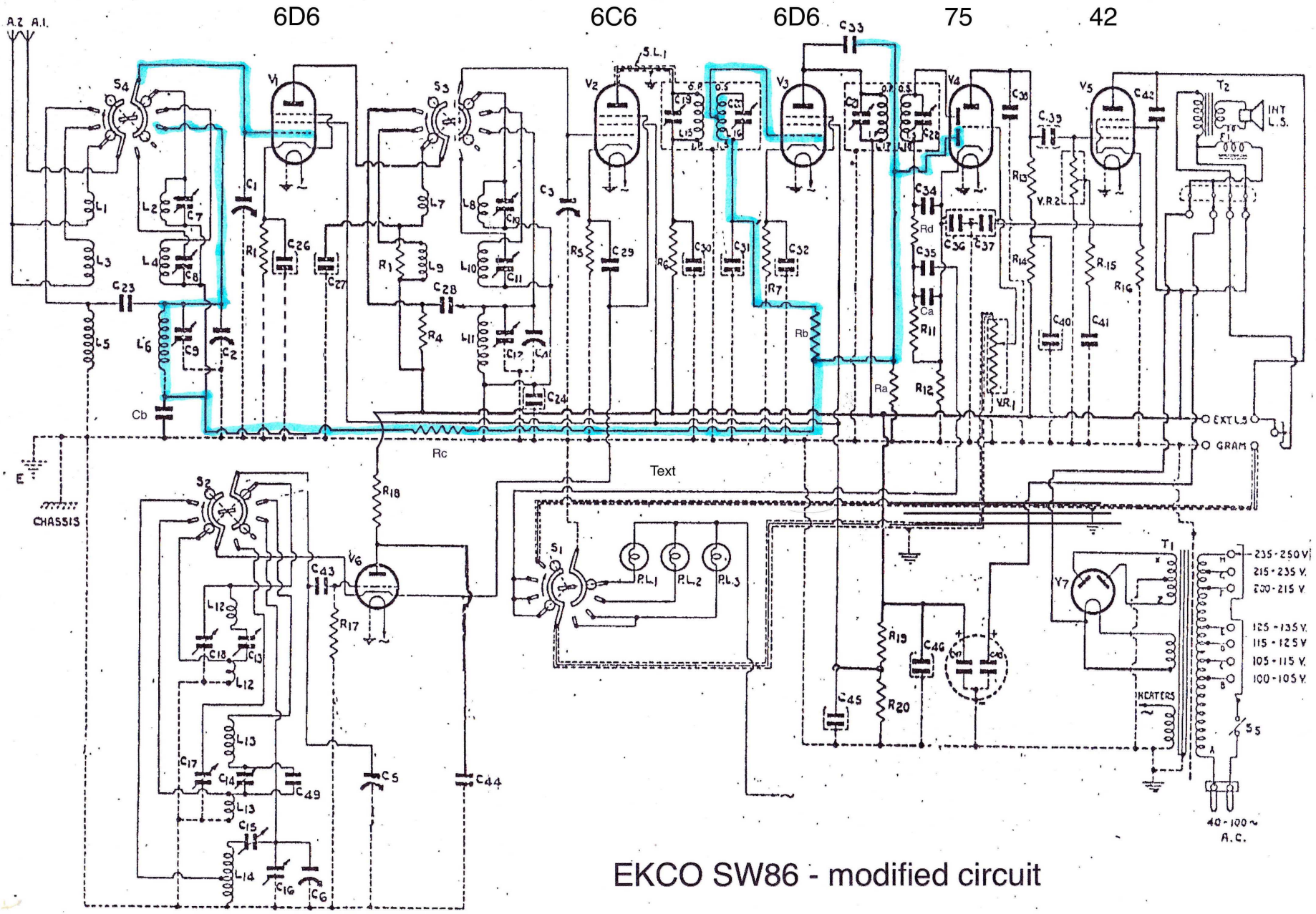
The modified and the original circuits are shown below, with the AGC lines highlighted in blue in both cases.

Notes

1. R5 (cathode bias resistor for 6C6) should not be allowed to drift much above its value of 15kΩ because the valve is already operating near its cutoff point.
2. As there is gain to spare, the cathode bypass capacitor C37 can be omitted, which will reduce distortion in the output stage.

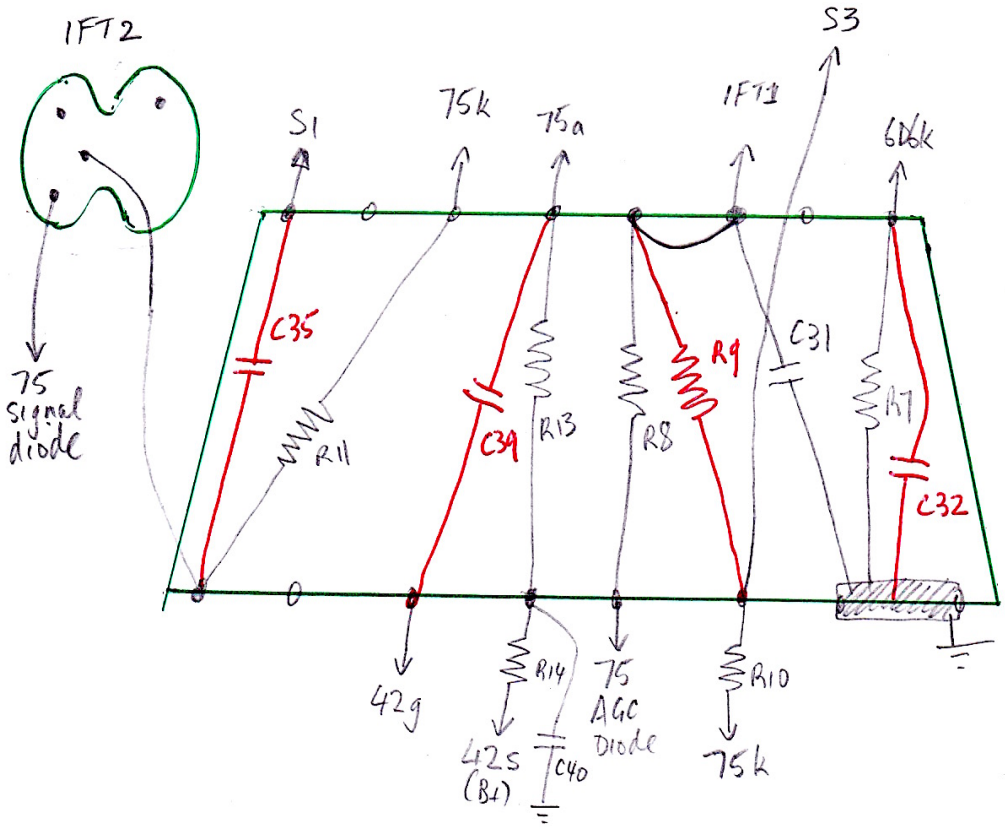


EKCO SW86 original circuit

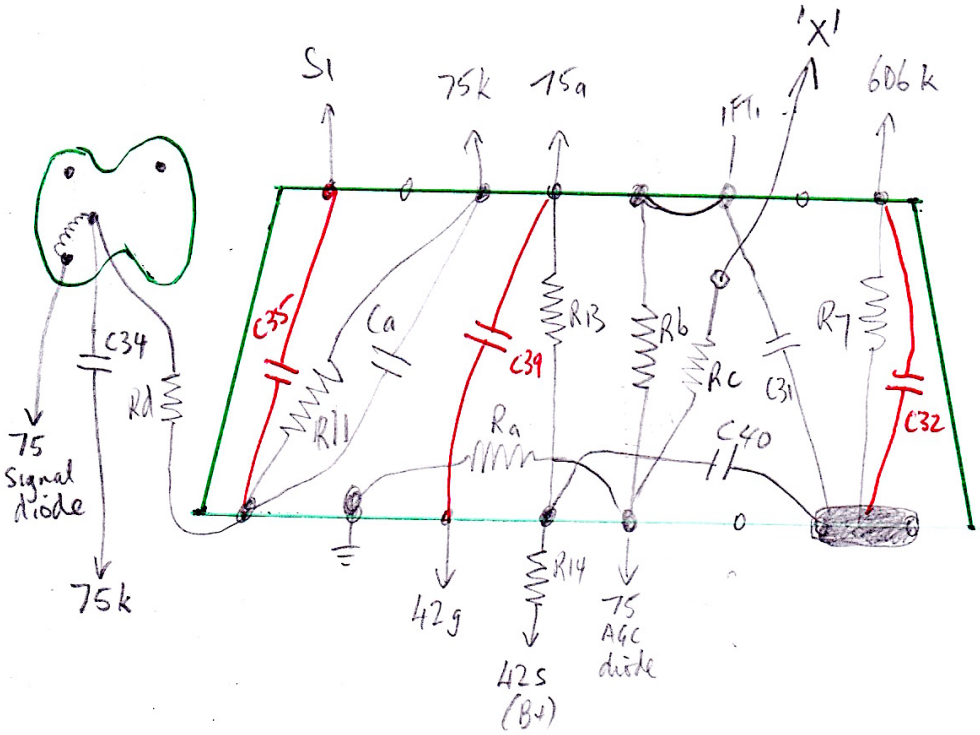


EKCO SW86 - modified circuit

EKCO SW 86 Mods



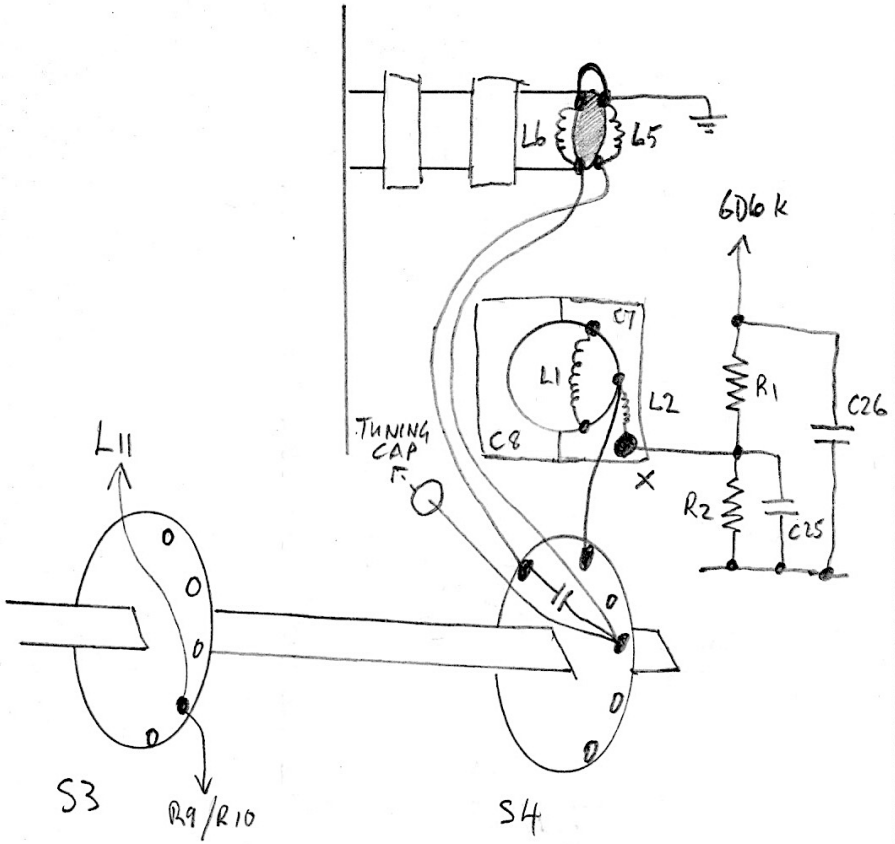
ORIGINAL



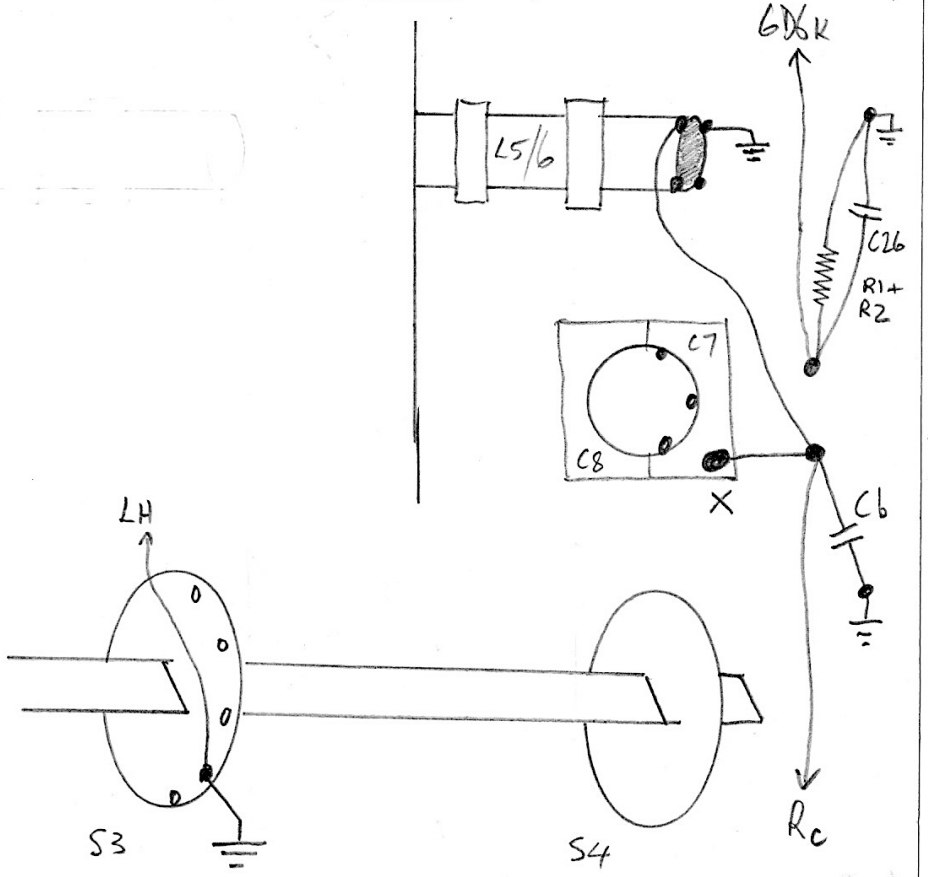
MODIFIED

RED UNDERSIDE
BLK TOPSIDE

ORIGINAL



MODIFIED



$R_1 + R_2 = 500\ \Omega$

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