

RC NETWORK (Excerpt from Jazzman Blog here: <http://jazzman-esl-page.blogspot.com/>)

The segmentation scheme and resistor values were derived using the *Segmented ESL Calculator* spreadsheet. From the spreadsheet options I chose *Symmetric Config 2*, both stators segmented, in *eight* electrical sections. For my panel the spreadsheet calculated 120k Ω for R , with $R/9$ series resistance on the section one wire groups, $0.75R$ on section two wire groups, and R on sections 3-8 wire groups.

It's common practice to move/reflect the section one resistances to the primary side of the transformer to protect against core saturation (see **Schematic**, damping resistor R1). Reflecting section one's $R/9$ resistances across an ideal transformer would divide the sum by the turns ratio squared (4.6 Ω). However, placing this much resistance on the primary side of a real transformer with its winding resistance, leakage inductance and winding capacitance, would result in significant rolloff of high frequencies.

The transformer winding capacitance adds to the load capacitance and its leakage inductance combines with the load capacitance to generate an ultrasonic resonance peak in the frequency response and rapid rolloff above it. Coincident with this response peak is an impedance minimum which can be a difficult load for the driving amplifier. When series resistance is added on the primary side it dampens this resonance peak. Too much resistance on the primary side over-damps the resonance, rolling off the high frequencies.

The spreadsheet assumes an ideal transformer is used, so it doesn't calculate the effect of resistance on the primary side of a real transformer. *The general guidance is to omit the section one resistors, add a 1 Ω series resistor on the primary side and give it a whirl.* My panels sounded really good with this initial setup.

From there the only tuning, if any, is adjusting the series resistance on the primary and/or the first two stator sections to dial in the treble response. Less resistance increases treble and visa versa. My old ears don't hear the highs so well but I didn't want less than 1Ω on the primary side and the section one resistors were already omitted, so I reduced the section two resistors from 0.75R (90kΩ) to 60kΩ to brighten up the treble, and that works for me.

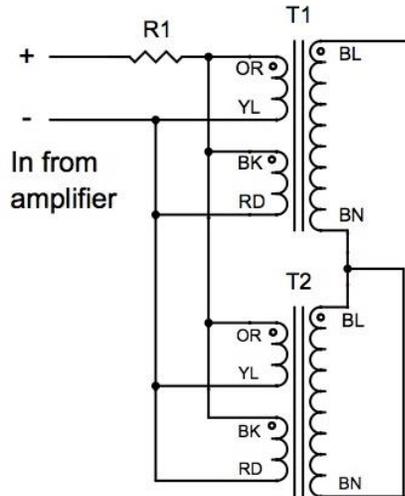
The schematic and parts list show the spreadsheet values except with section one resistors omitted and reflected as 1Ω on the primary. I think this would be optimal for most listeners.

All remaining resistors on the secondary side are 2W, 500V in series. Wattage/voltage are highest across the first resistors and decrease down the line. Multiple resistors are ganged to spread the load, as follows:

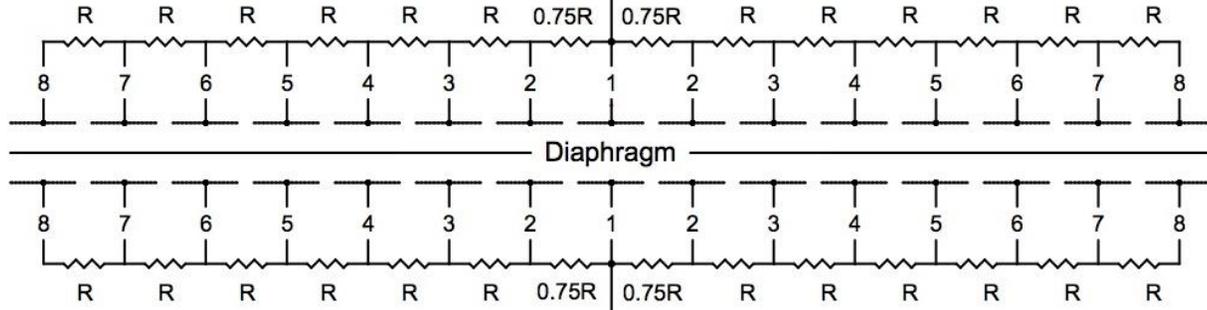
- Section 1: none (reflected as 1Ω on TFMR primary)
- Section 2: (3) 30kΩ
- Sections 3, 4: (3) 40kΩ
- Sections 5-7: (1) 100kΩ + (1) 20kΩ
- Section 8: (1) 120kΩ

Step-up transformers

Rear stator - 15 wire groups / 8 electrical sections



RC line: $R = 120k\Omega$



Front stator - 15 wire groups / 8 electrical sections

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Bias supply (2.7kVDC)

