

## F5-HA Using a Passive Cross Feed Filter

XEN Audio  
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In the original F5-HA configuration, the RCA inputs were feed to a high impedance cross feed filter, followed by a JFET buffer. A volume control attenuator is placed between the buffer output and the F5-HA JFET input.

In the XEN modified Danyuk and CMoy modified Linkwitz filters, each of the outputs of the cross feed filter sees a single resistor (R2) to Gnd of 5.5k. Since this is a constant value resistor, one obvious variant is to replace R2 with a 12k resistor in parallel with a 10k log pot. The two in parallel will make 5.5k, and the wiper of the 10k pot now goes to the JFET buffer, which then drives the F5-HA input directly with low impedance.

One can also argue that since we were using a 10k pot to drive the F5-HA, there is no reason not to do this here and get rid of the buffer altogether. Indeed, this is a workable alternative with almost no downside. The only requirement is that the log pot should have identical resistance on both channels, and be of good quality. A switched attenuator will fulfil this requirement easily.

But then I was also using a LDR based attenuator with a fixed 10k series and a LDR as shunt. This is not constant impedance, and cannot be used directly to replace R2 ?

At least in the case of the modified Danyuk and modified Linkwitz, the cross over characteristics are mainly determined by the other components and not R2. So even when using another value of R2

(anything between 10k and 50R), the cross feed frequency response will essentially remain unchanged. Only the output amplitude will change in proportion to the value of R2.

So why not just replace R2 with the LDR directly ?

Indeed that will also work. But some detailed analysis will show that for the same output voltage of the attenuator, the LDR will now see about 3 to 7 times the dissipation as before. And since the LDR does have somewhat high tempco and is susceptible to thermal distortion, this is certainly not a good idea. One can also put a 10k resistor in parallel, but that only really helps at high impedance levels. At low impedance, most of the current (and hence heat) still goes through the LDR.

A workable solution is however one that is identical to that of a 10k log pot. One can simply replace R2 by a 12k resistor in parallel to the LDR attenuator (of 10k series and LDR shunt). Since the LDR attenuator is not constant impedance, the effective value of R2 will vary between 5.5k and 8.7k, which is still fine with the cross feed filter. The dissipation in the LDR is now essentially the same as the original configuration (cross feed – buffer – attenuator), except at maximum volume where it is about 1.6x. The only caution is to limit the maximum resistance of the LDR to about 22k. But this can be achieved easily by setting the minimum current in the LDR current source.

So if you wish, you can now get rid of the JFET buffer and its power supply with no penalties, at least as far as scientific analysis can tell. ☺

