A decisive tweaking

Review of DACSM5872BS filter output by Mauro Penasa,

Regarding Marantz 53/57/63/67 series

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At the end of these experiments we need to edit the last modification done on the Marantz 53/57/63/67 models, intervention that closes the operations of tweaking on this family of popular and beloved old players.

A brief foreword: while performing the usual mods we noted that the machine, at this level of tweaking, was unable to properly place instruments and voices, in the space, (air, stage). This even if the machine was able to detect and revealing their existence in the recording. Mauro Penasa (as usual in this part of the world), in reply to a public help request to try to solve this issue, proposed this last tweak.

Let's focus on the "heart" of the modification: as mentioned before, referring to the TNT Audio article, Loesch proposed a modification of rather difficult implementation with the purpose of removing the “digital noise” marring his 63..

You will remember the coaxial cables from decoder and other.

Today we are proposing a different solution to the same problem. Different is also the assumption: if the noise floor produces an extremely poor sound from the analogical output of those cdplayers, the issue has its core in the filter after the dac. The digital circuits of the player, helped from the new voltage regulators, from the improvement of the bypasses, from the inductive filters, are perfectly within regulations as far as pollution is concerned. On the contrary is the approximation with which the analogical filter is implemented that allows for the signal to be matched from PWM noise emitted from the player. Regarding the value of the capacitor, notice the following in the simulation: It is a variation of the capacitor between 0 to 440pf. 470pF value it's out of range of this evaluation 'cause is too much high then would attenuate (no so much actually) the band around 20khz, generating a very weak response that someone not too expert would call "super-analogical". Mauro pointed to 220pF for a good result or 330pF to take advantage of the maximum compromise between the elimination of the noise floor and an acceptable frequency response (we remain around -0.5dB -0.7dB at 20Khz....).

I tried both, actually I started from 120 pF and, in full agreement with Penasa I settled around 330pF.

One should note that the phase response of the whole filter, green line in the graph below, remains unaltered independently of the value configuration chosen. Still as you can find out changing the values Of C607/c608, you will generate a great change working on OPA

network , as it was suggested a while back by T.L. and many others less deserving in various international web sites and forums.

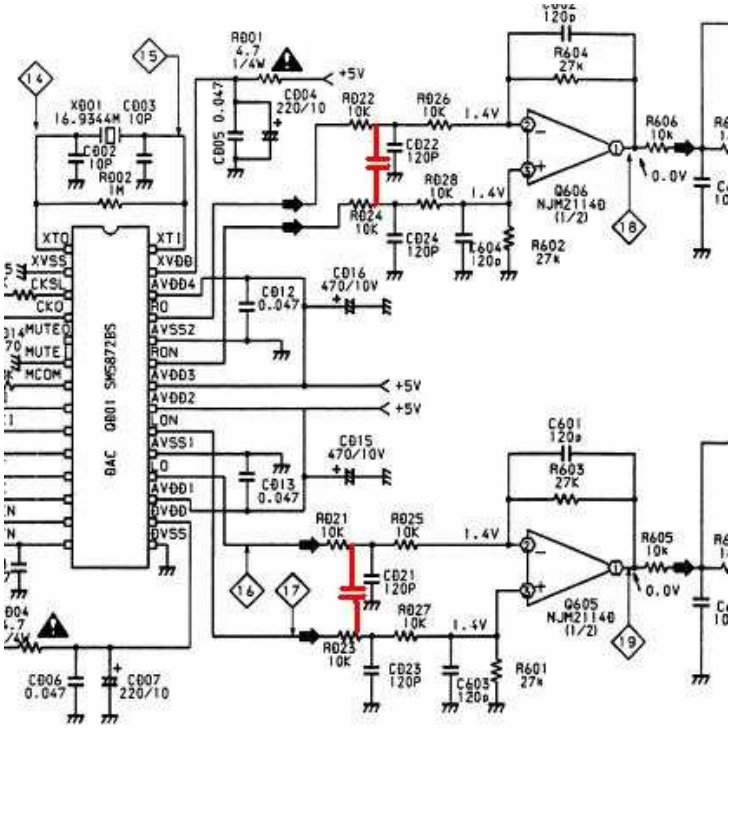
Penasa's approach implies the improvement of the filter with the purpose of reducing the existing digital noise floor in the audio band, generated by ultrasonic band modulations, around 250-350khz.

You will remember that previously I mentioned the modifications of the filter cut-off frequency, obtained following the advice of T.L. and increasing the value of c 608 and c 607 from 150 pF to about 220 pF.

These changes do not modify the noise shape at the existing stage. On the contrary they reduce the high frequency response of the player, without reducing the D/A conversion noise that is often ascribed to this family of CD players.

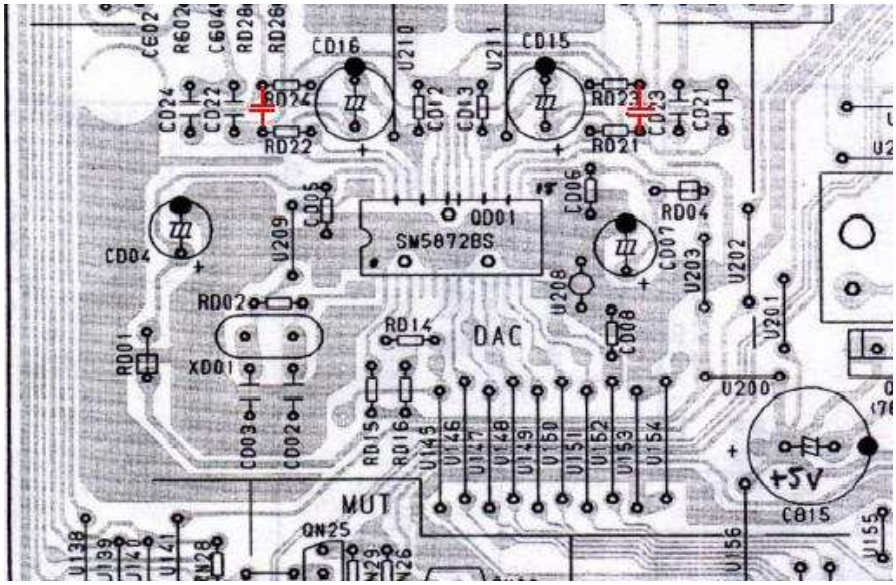
According to Penasa, the filter response must be left exactly as is (c607/c608 100pF) and what needs to be reduced is the pollution from Dac's activity: the proposed solution is thus the adoption of: a differential ultrasonic filter applied on the noise generated by the PWM modulator output of the SM5872BS. The original analog filter cells provide only the common mode filter function, thereby being useless for our objectives.

First of all this in red is the modification to implement as presented on the Intervention scheme.



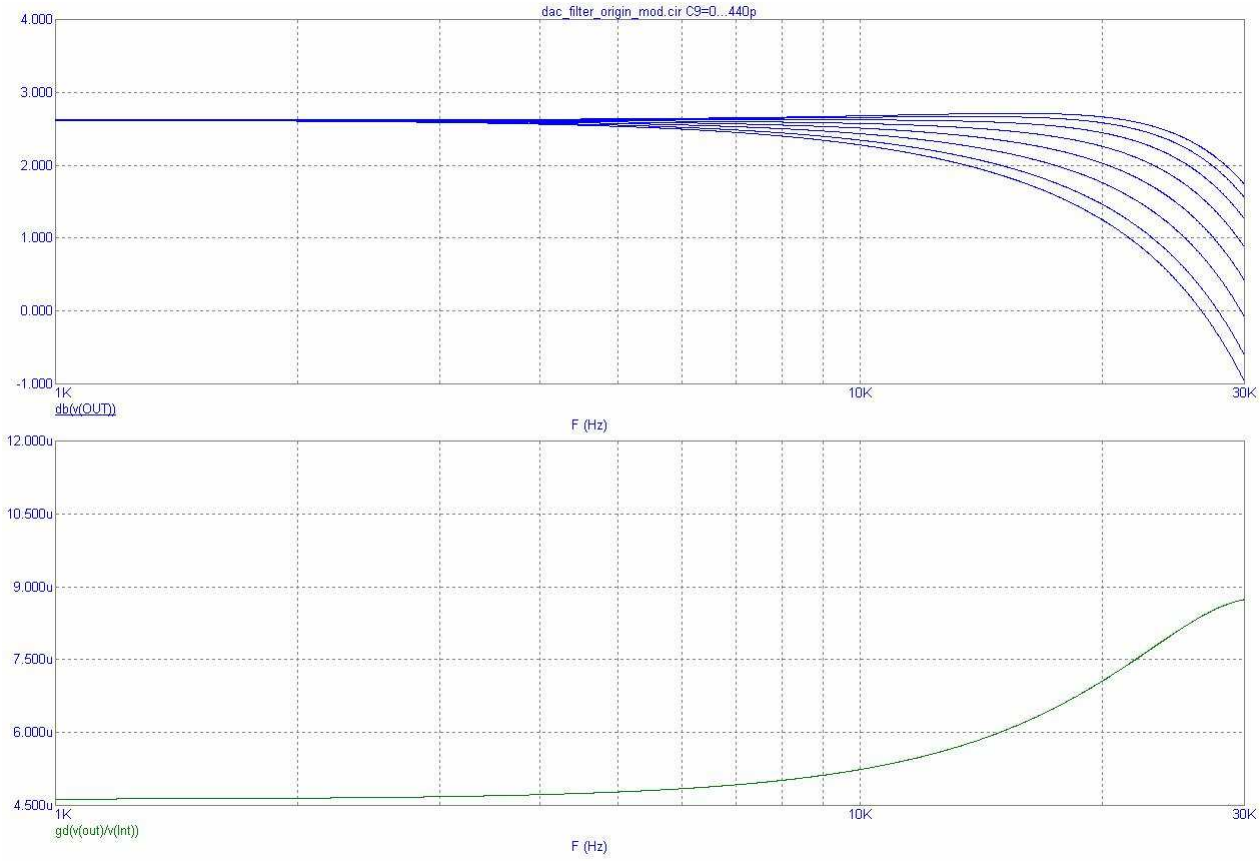
You will notice the presence of the new parallel capacitor at the DAc's outputs, below the first Rs of the filter.

The position on the pcb of the newcomers is the following: components side or solder side, as you wish:



It is clear that our evaluations and the simulations done by Mauro are pertinent only for the addition of a filter capacitor while all the other cell need to remain at their original values. For example as I did in my trials, only moving from 100 to 120pF or 150pF on the caps of the last cell generates changes similar to those from 0 and 400pF on the additional cap, without generating the same positive impact on the noise (the impact is close to none and we also experience reduction in audio band).

Figure 3



I believe that from the technical side this is all.

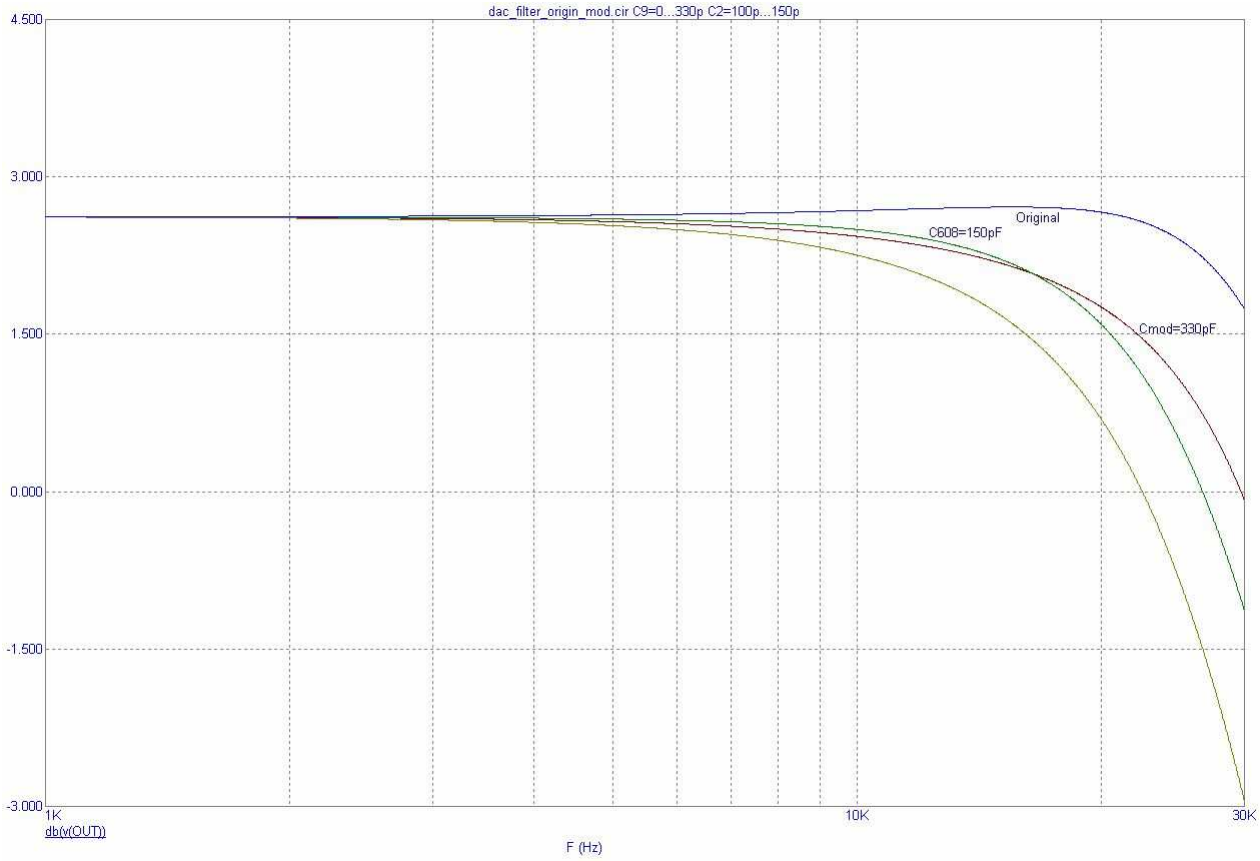
On last useful piece of information: the cap should in my view be the following:

Farnell, code 9520759 CR COMPONENTS FSCEX 330PF 1% 630V

For transparency we should investigate in detail the meaning of the tweaking operation proposed to reinforce its technical and scientific merit and to offer a medium for further discussion and comparisons.

The graphics below are at the essence of the decision made for the definition of the objective of the change.

Graph 1



In this first graph we can notice the following: the comparison between the T.Loesch's original filter, in TnT-Audio articles (with 150pF instead of 100pF) and the filter elaborated by M. Penasa with the suggested differential filter capacitor (330pF).

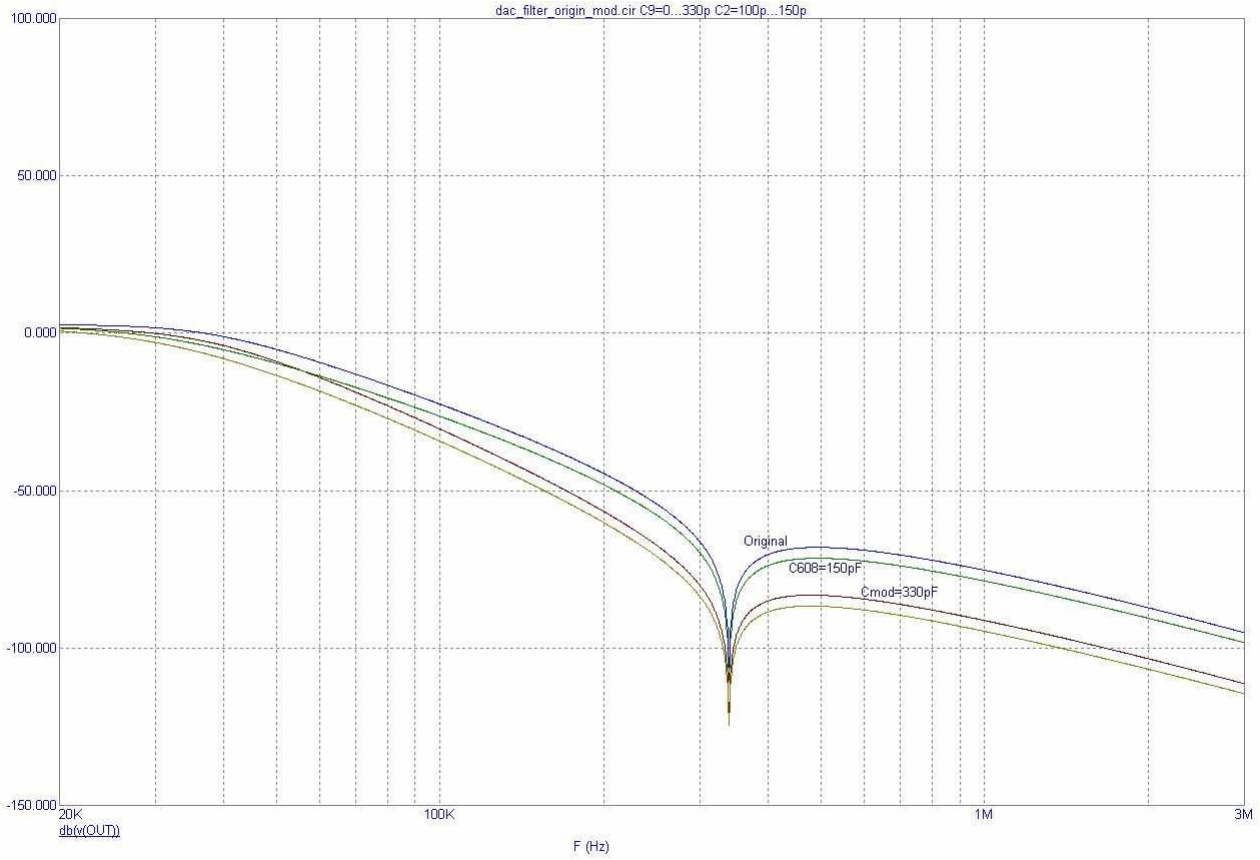
The original (blue) is slightly emphasized, as everyone keeps saying....

The TL modification, while small at 150pF (he mentions to go all the way top 220pF, but this is debatable) is the green line;

The modification with 330pF is the adjacent brown line;

You will notice that the 330pF, begin out of band , has a more regular behaviour, with a small difference in attenuation (about 0.1-0.15db) at 10Khz, and actually presents a better extension at 20Khz if compared to what presented in the old TNT article.

Second graph



Here we show the same comparison in the area of influence of the PWM (20Khz to 3Mhz) You will notice that the version with 330pF follows a much stronger cleaning action of the new, changed, filter starting from 50khz if compared to the T.L. original version . It becomes more efficient of about 20dB in the critical zone of the PWM (about 350khz where

You have the peak generated by the inductance of the filter output?

N.B. you might have noticed the malva-green trace in the graphs. The simulation implies 4 steps: with C608 100; 150pF; C.mod. 0 ; 330pF

Consequently the trace at the bottom is the forbidden condition for our intended objectives because it assumes both the C.mod. of 330pF and with 150pf over C608, while the actual modifications made are implemented on either one or the other.