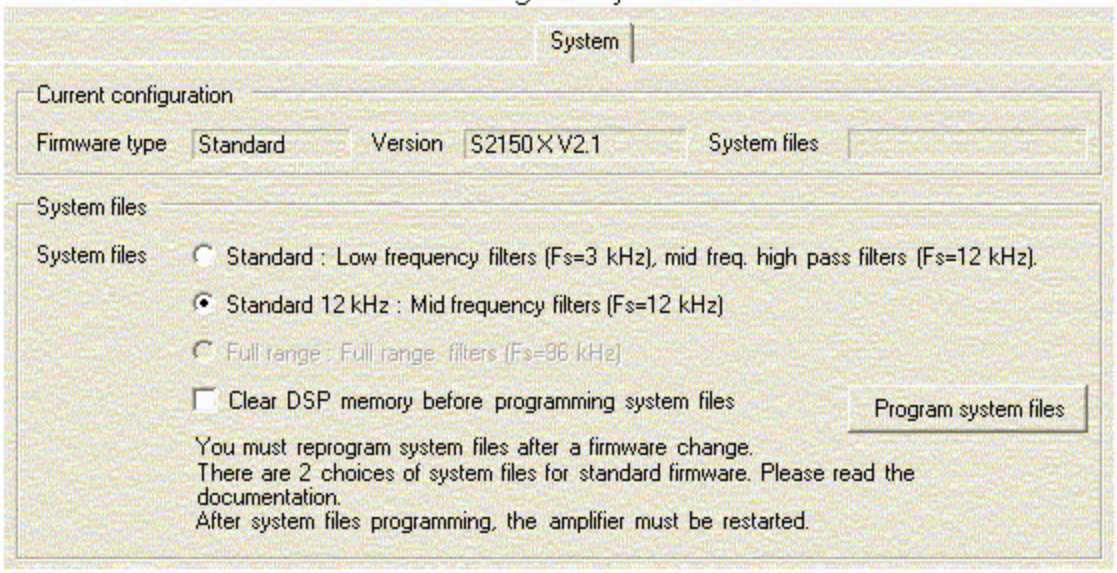
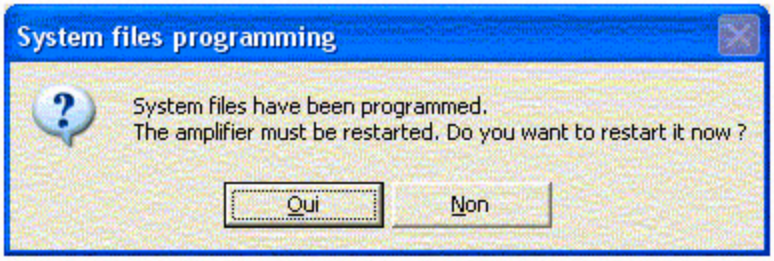
1. CONFIGURATION OF THE AMPLIFIERS

The programming of the midrange amplifier requires a stage in precondition: it is the change of system files in order to replace the Fs=96 kHz filter in S2150.

In the menu Remote control/Amplifier Midrange/System, choose the system files Standard 12 kHz and to click on Program system files.



With the end of the programming, the amplifier must be started again.



Answer Yes, the new system files are now recorded in S2150.

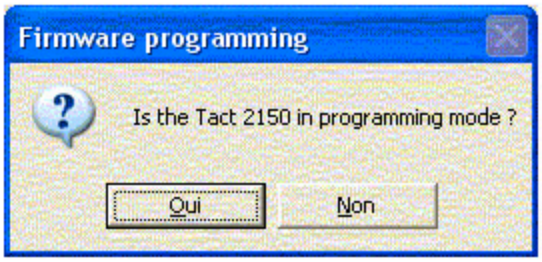
It is not necessary to reprogram the firmware to pass from standard system files to standard system 12 kHz files.

The programming of the high-range amplifier also requires a stage in precondition: it is the change of firmware in order to use the filters Fs=96 kHz.

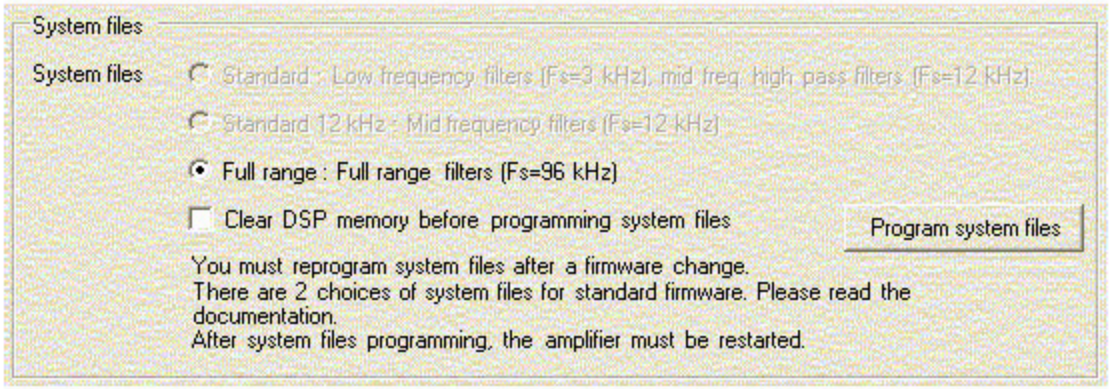
In the menu Remote control/Amplifier High/System to choose the firmware of the type S2150 Full range and version 2.1.
The amplifier must be alone without connection with the other amplifiers. Click on Program firmware.

Put S2150 in programming mode by pressing the Digital and Analog buttons simultaneously.

Click Yes.



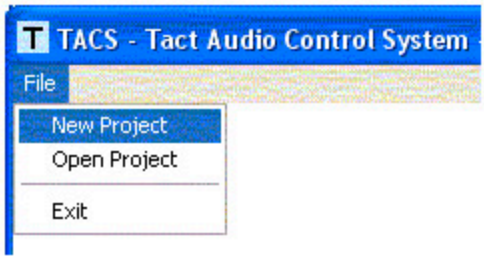
After the reprogramming of the firmware, it is necessary to reprogram the system files.



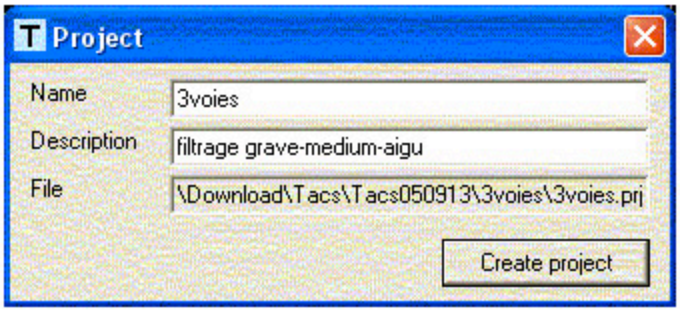
To click on Program system files then to start again the amplifier.

2. DEFINITION OF THE PROJECT

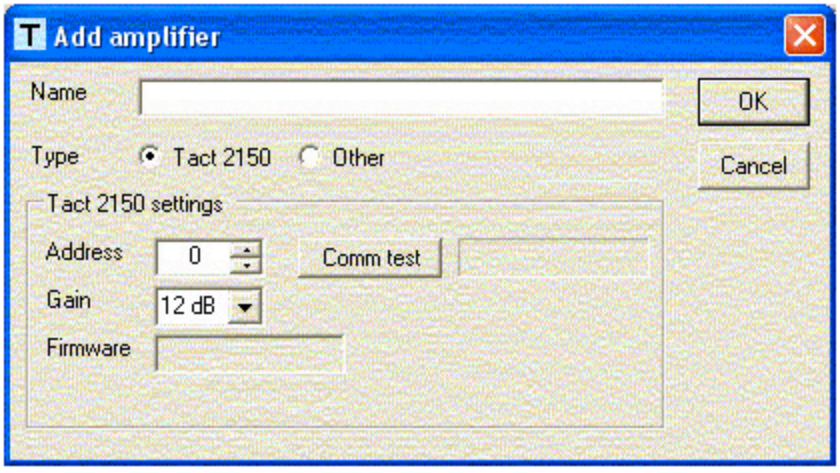
To create a new project: The project manages all the amplifiers, the RCS, the filters, etc..., it is thus necessary to give it a total name



And to give it a name (3voies in this example)

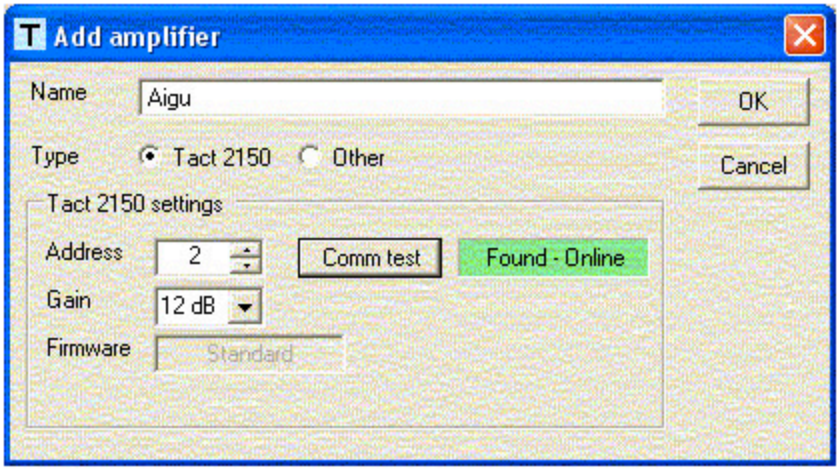


To declare the amplifiers in the Configuration/Project/Amplifiers menu while clicking on Add



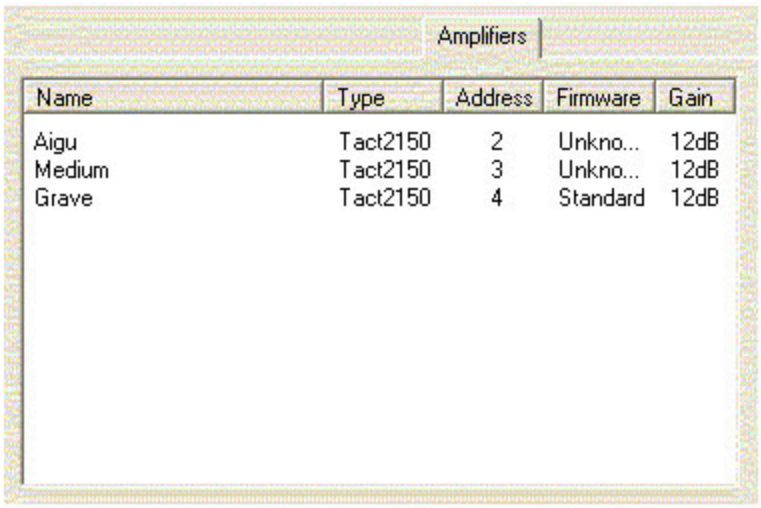
Give a name to the first amplifier (High in the example) and to specify the address (2 in the example).

Then select Comm test to check for a good connection between the RS232 input of the amplifier and the COM port of the PC. A good communication results in Found - Online

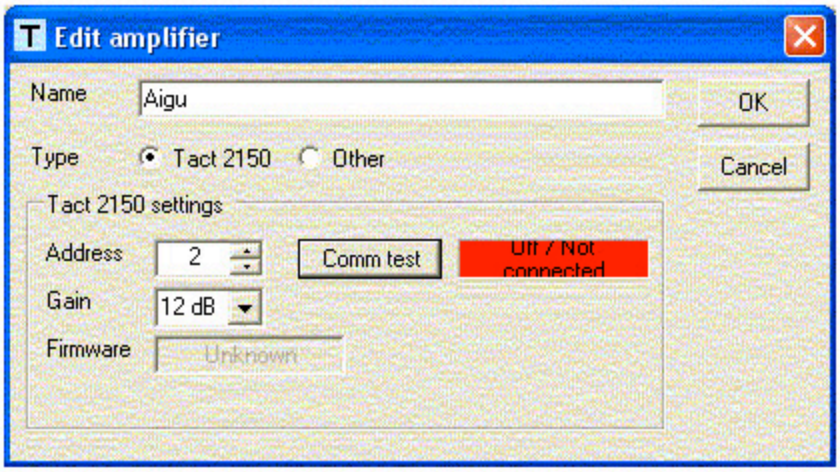


Then add the midrange amplifier, then the low amplifier.

The amplifiers then appear in the list of the amplifiers.

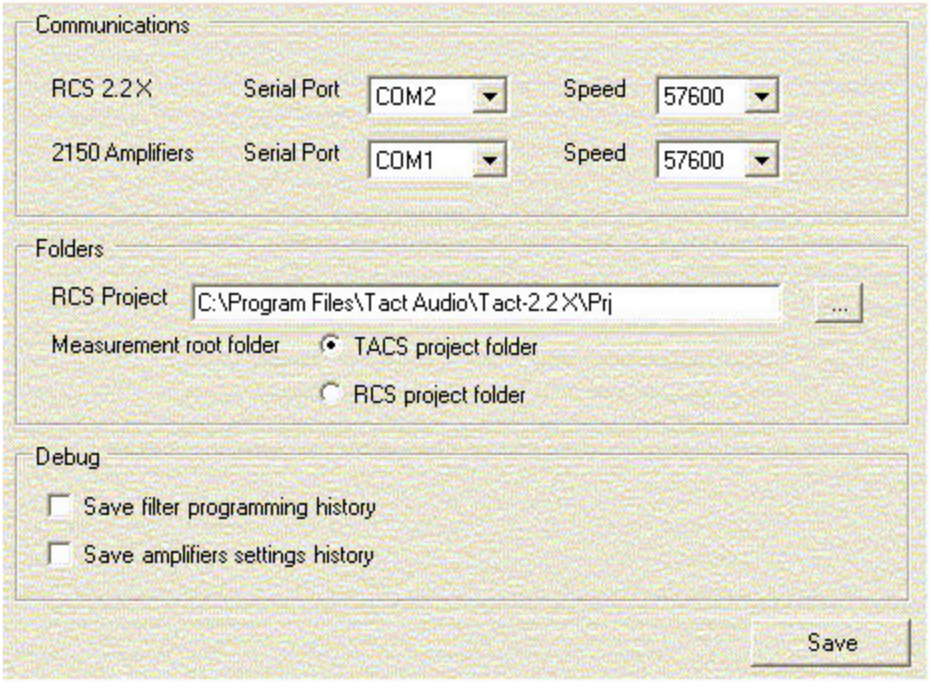


If the message Off/Not connected appears at the time of the test of communication,

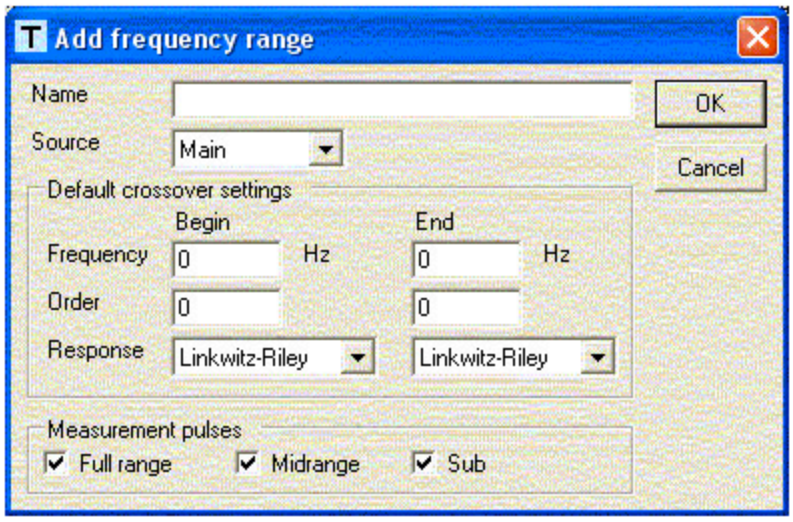


it is necessary to check the parameter setting of the PC connection: port (here Com1) and speed (here 57600) in small Settings/General or the Configuration/General menu,

and configure the S2150 with same speed in small Comm (Baud Misses = 57600).

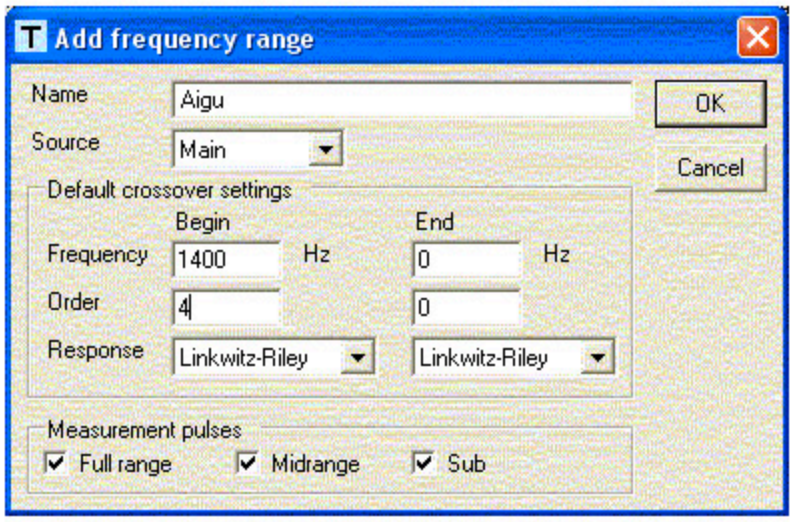


For the amplifier, it is necessary to declare the frequency band of the filter.
In the Configuration/Project/Frequency Range menu, click on Add.



Frequency range corresponds to the ranges (with the direction frequency band) of the system. A 3-way system will have the ways low, midrange and high.

Give a name to the filter as well as the desired parameters (here high-pass 1400 Hz from order 4 Linkwitz type).

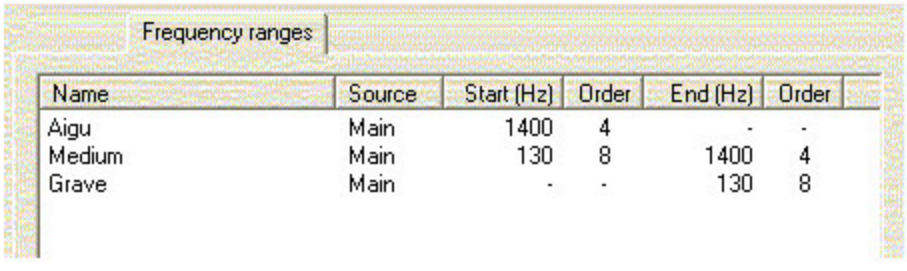


The parameters of filtering which one returns on this level are "generic" parameters, they are used at the time of the creation of a new filter for this frequency band but can be modified.

Add in the same way the midrange and then the low range.

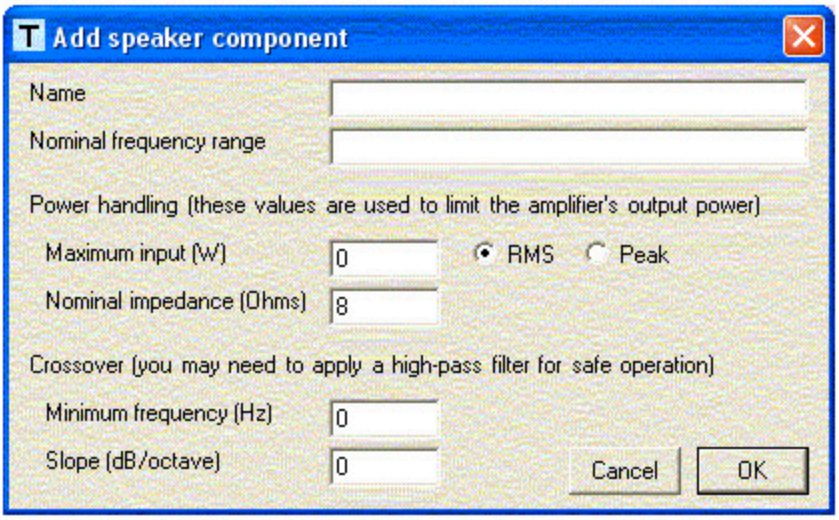
For the mid/high ranges, it should be indicated that the Source, i.e. the digital output of the RCS, is Main. For a subwoofer connected to the Sub output of the RCS, it should be indicated that the Source is Sub.
In the case studied here where the three amplifiers are in series on the Main output of the preamplifier, it should be indicated that the Source of the low range is Main.

The three ways appear then in the list of the ranges.

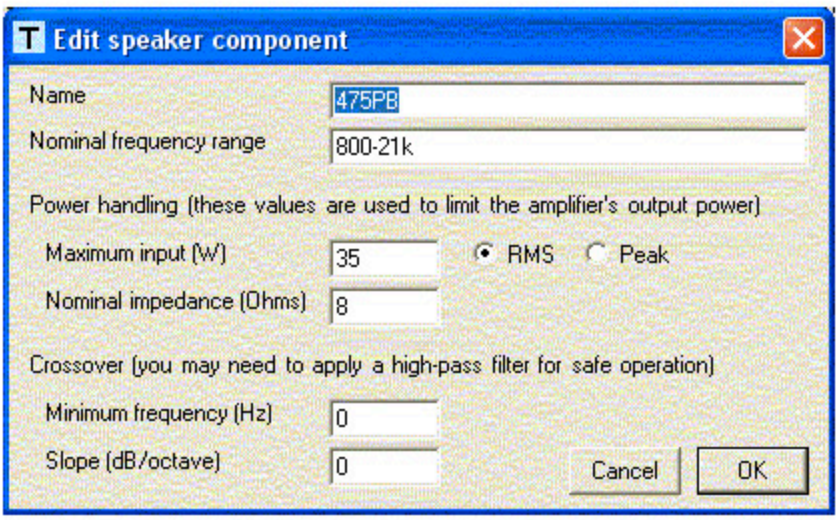


Name	Source	Start (Hz)	Order	End (Hz)	Order
Aigu	Main	1400	4	-	-
Medium	Main	130	8	1400	4
Grave	Main	-	-	130	8

This stage of the project, it is necessary to create the HP (speakers).
In the menu Configuration/Project/Speaker components click on Add.

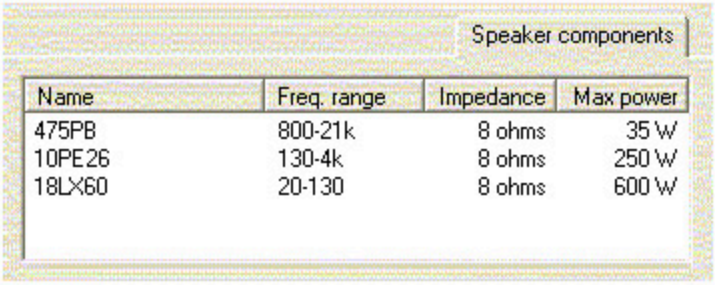


Give a name to the loudspeaker of the high range (475PB in this example) and click OK.



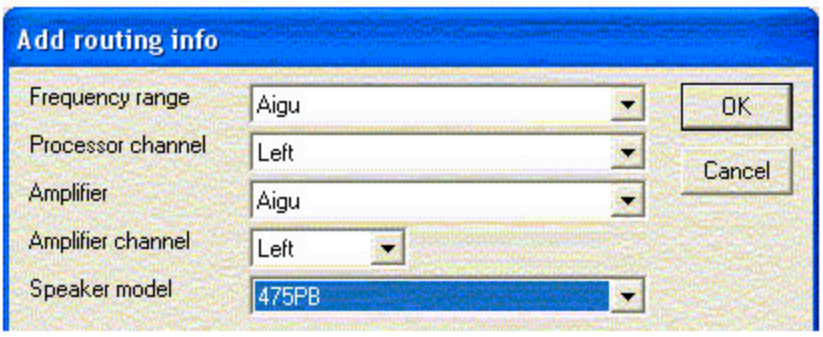
Also add the loudspeakers of mid and low ranges.

The loudspeakers appear then in the list of the loudspeakers.



It is then necessary to define the routing of the ranges to frequency/amplifier/HP.
In the Configuration/Project/Routing menu click on Add.

Choose the Frequency range, the amplifier (to amplify) and the

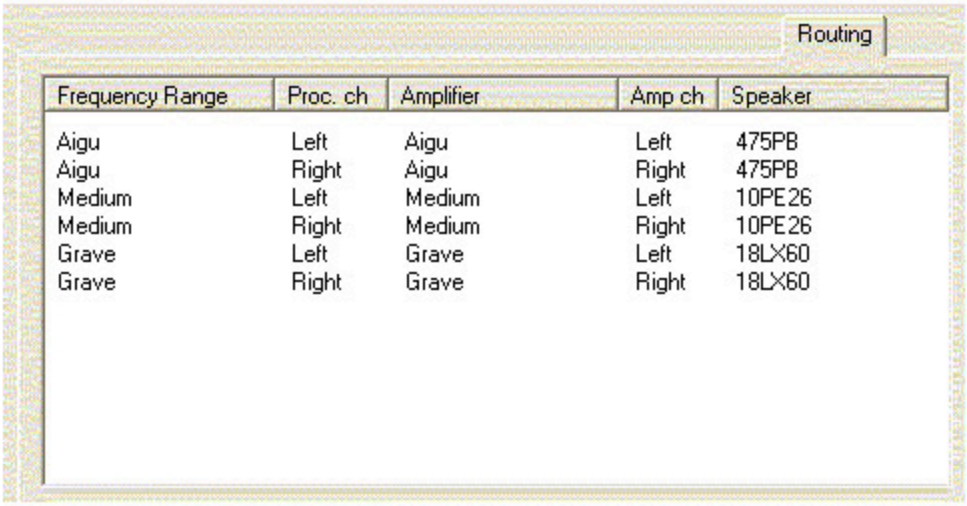


loudspeaker (speaker model).
Click OK.

Then click on Copy in order to copy the parameter settings of the left channel to the right channel.

Add in the same way routing for the mid and low ranges.

Routing thus defined appear in the list of Routing.



3. DEFINITION OF THE FILTERS AND PROGRAMMING OF THE AMPLIFIERS

It is now necessary to create the filters, which will be programmed in the amplifiers.
These filters will include the correction of each range.

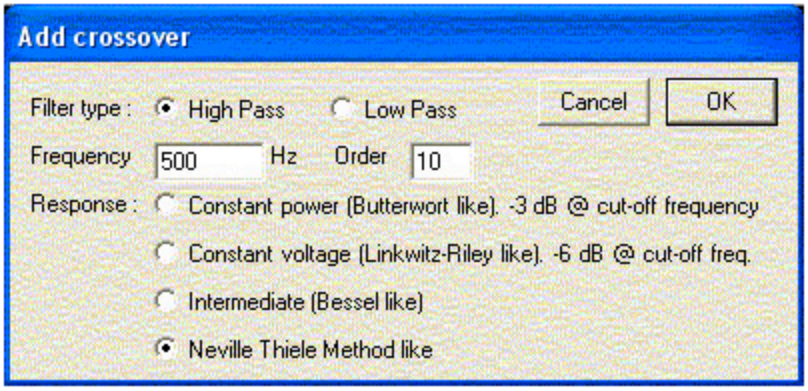
We will begin with measurement the response of the lows. The aural signal is in general insufficient to allow this measurement. We thus will add the high range filtered by high-pass.

In the Crossovers/Design menu click on Create new filter

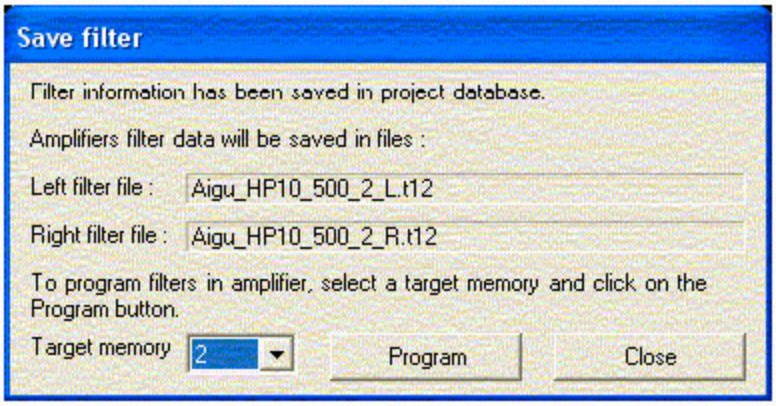
Choose in Frequency range of the high range and give it a name (HP10_500 in the example).

Remove the default filter by selecting it and then clicking on Delete.
Click on Add and define the filter that aims to avoid clipping during measurement from the low+high unit.

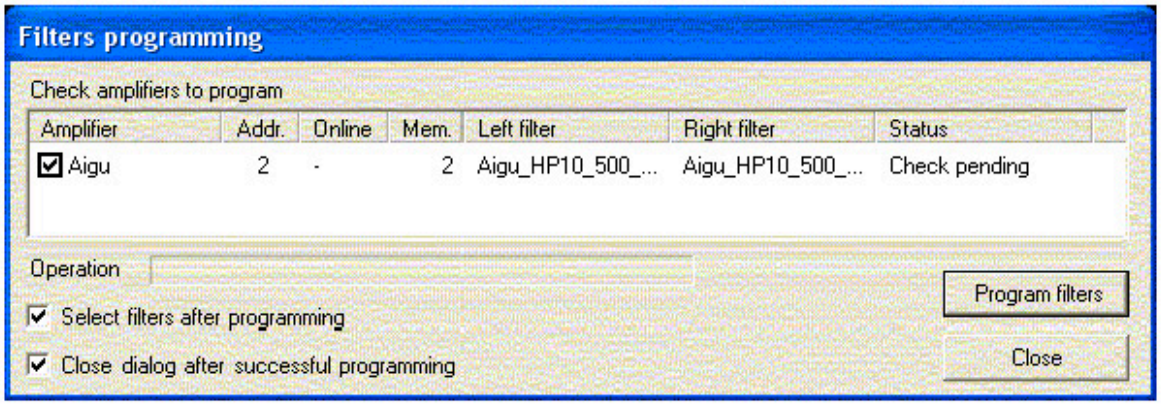
Select OK.



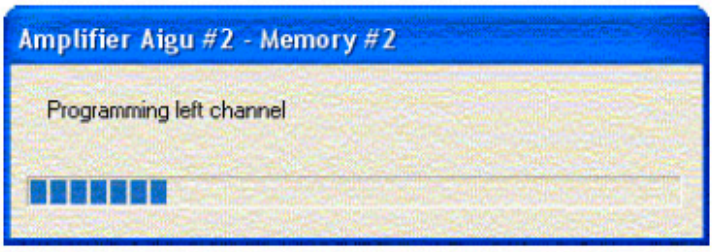
Click on the Save filter button so recording this filter and informing the number of the key associated memory (here Target memory = 2).



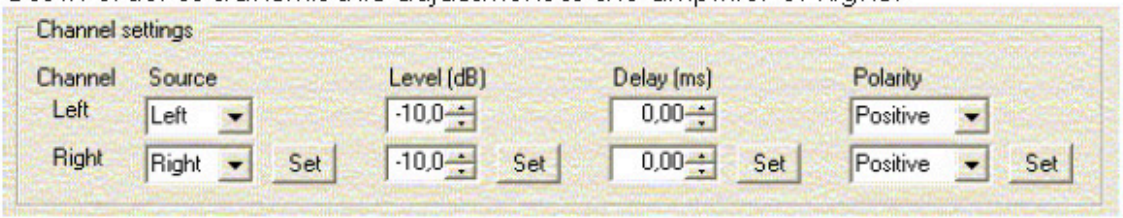
Click on Program in order to reveal the programming screen.



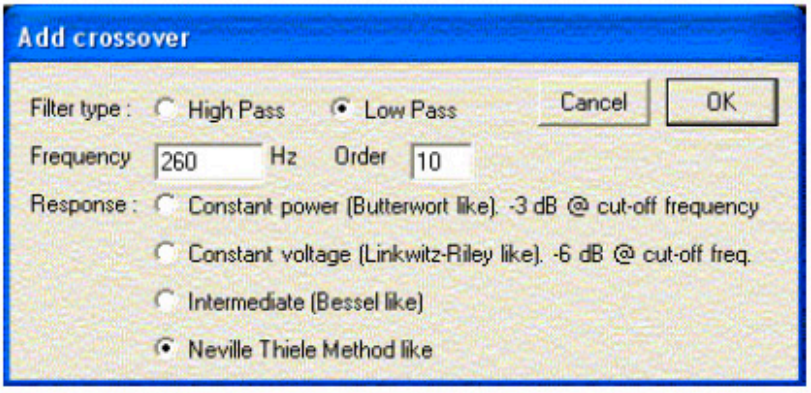
Click on Program filters in order to program the high range amplifier with this filter in memory 2.



In the menu Remote control/Amplifier High indicate a level of -10dB and select Set in order to transmit this adjustment to the amplifier of highs.



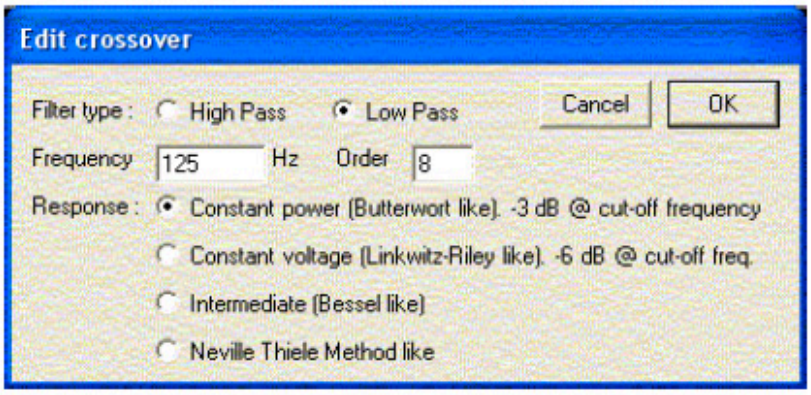
We now will create a filter for the measurement of the low range.
In the Crossovers/Design menu click on Clear filter data, then on Create new filter.
Choose in Frequency range the Low range and give a name (LP10_260 in the example).
Remove the default filter by selecting it and then clicking on Delete.
Click on Add and define the filter that aims to filter the low range during the measurement of the low+high unit.
Select OK then Save filter then choose Target memory (2 in the example) then select Program then Program filters.



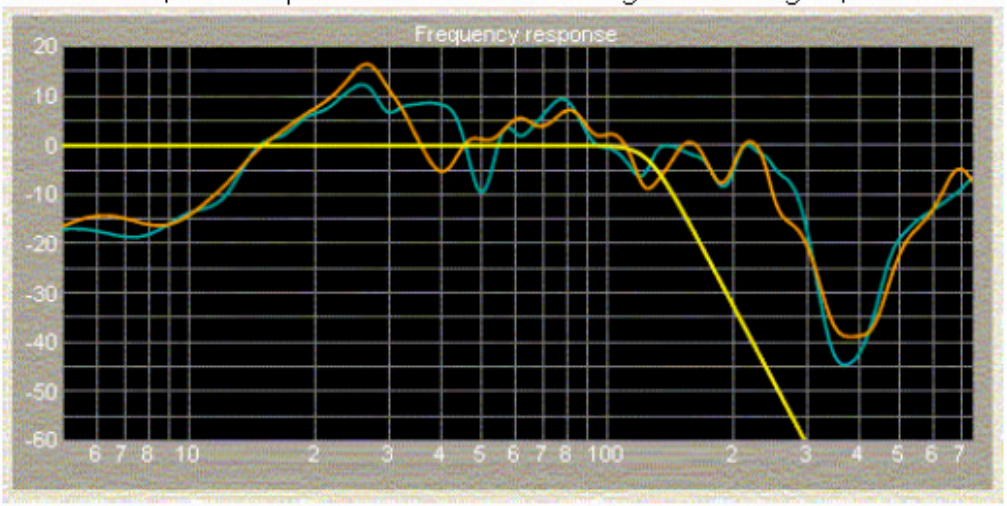
Now make the measurement of the low unit filtered + high

unit filtered without the midrange and the measurement of the midrange alone. These measurements will be used for the correction of the low, mid and high frequencies.
TACS makes it possible to control the RCS in order to carry out measurements. With the TCS here used, this measurement is carried out with the Tact software.

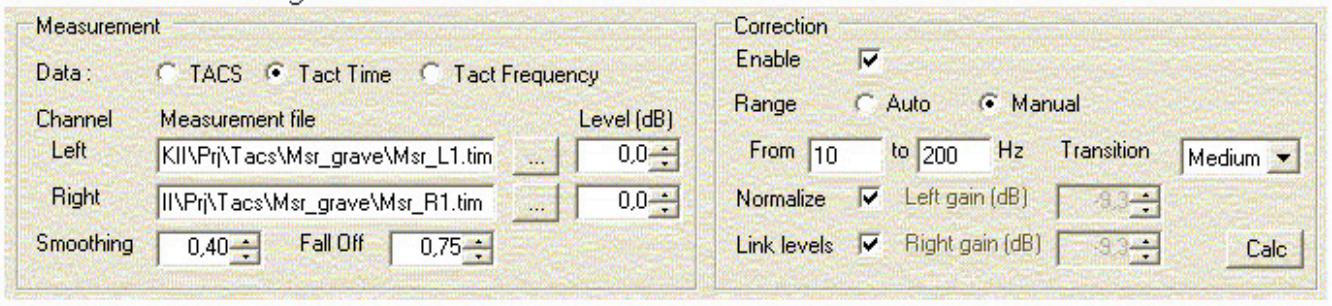
In the Crossovers/Design menu click on Create new filter, choose the low range and give it a name (LP8_125 in the example). Click on Edit to check the filter proposed by default. It is possible to choose the type of filter, the frequency of transition, the order of the filter and the type of response curve. Click OK.

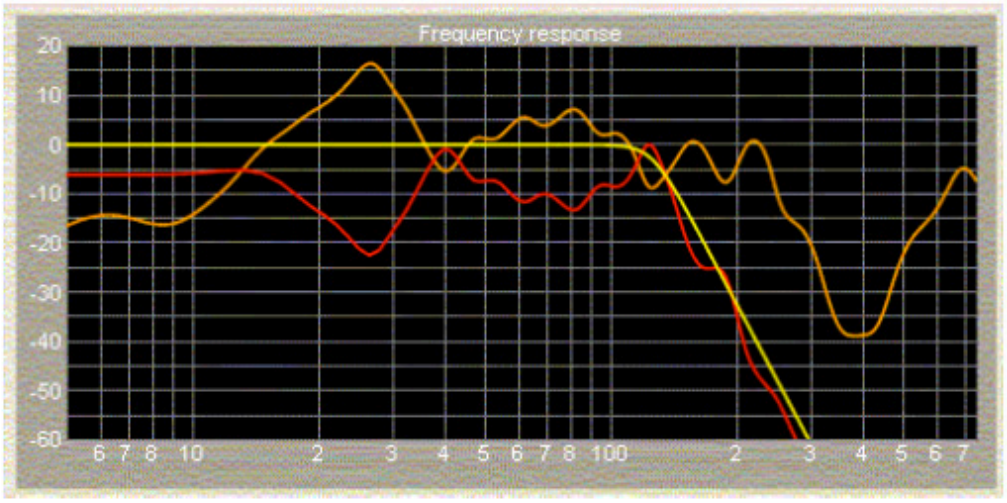


In the Crossovers/Design/Correction menu click on Tact time and choose the files of measurements of the filtered low range (+ high filtered).
For the low, set the parameters of smoothing Smoothing=0,40 and Fall Off=0,75.



Click on Enable Correction and choose a Manual range between 10 and 200Hz. Normalize the filter with Link levels selected in order to have the same level on the left and on the right.

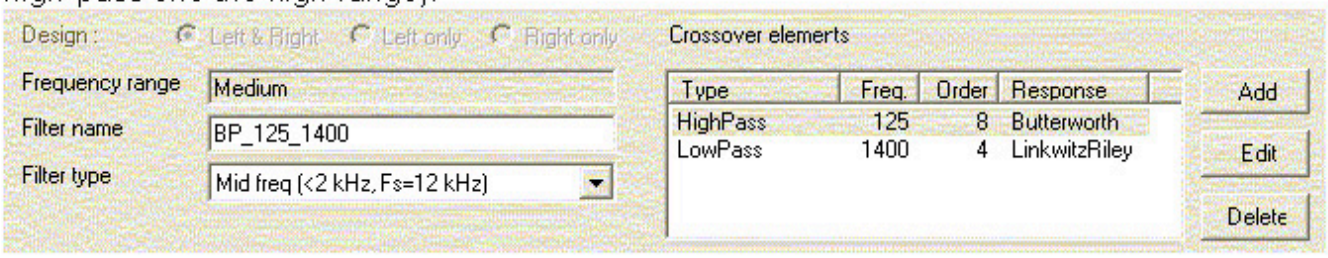




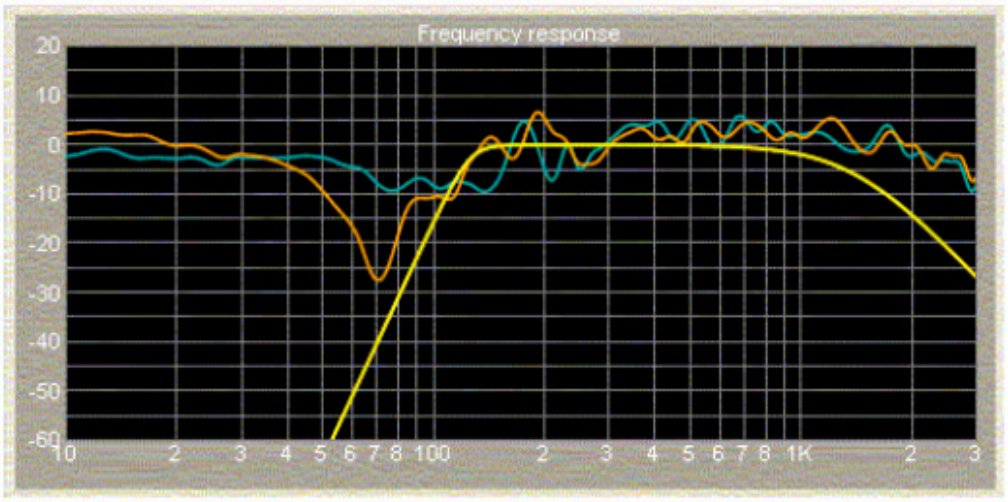
The yellow curve represents the target i.e. the final response curve that one wishes to obtain.
The orange curve is the response of the the left channel.
The red curve is the response curve of the filter that will be programmed in the amplifier.

Click Save filter, choose Target memory 1 then click on Program and Program filters.

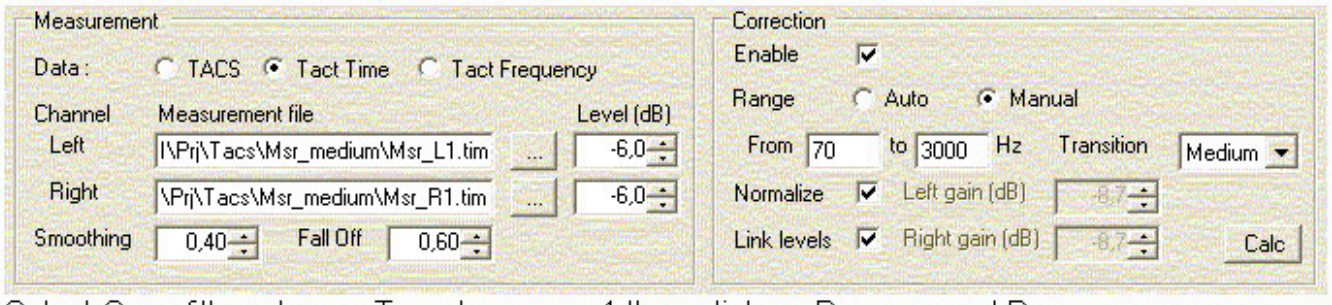
We now will create the filter of the midrange.
In the Crossovers/Design menu click on Create new filter, choose the midrange and give it a name (BP_125_1400 in the example).
The filters are of the Butterworth type for the high-pass one (as for the low-pass one of the low range) and of the Linkwitz type for the low-pass one (as for the high-pass one the high range).



In the Crossovers/Design/Correction menu click on Tact time and choose the files of measurements of the midrange alone.
For the midrange, use the parameters of smoothing Smoothing=0,40 and Fall Off=0,60.

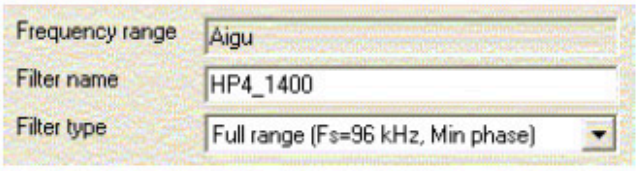


Click on Enable Correction and choose a Manual range between 70 and 3kHz.
Normalize the filter with Link levels selected in order to have the same level on the left and on the right.
In addition the gain of measurement is adjusted (-6dB) in order to have a mean level of the measurement of approximately 0dB in the range of use of the HP.

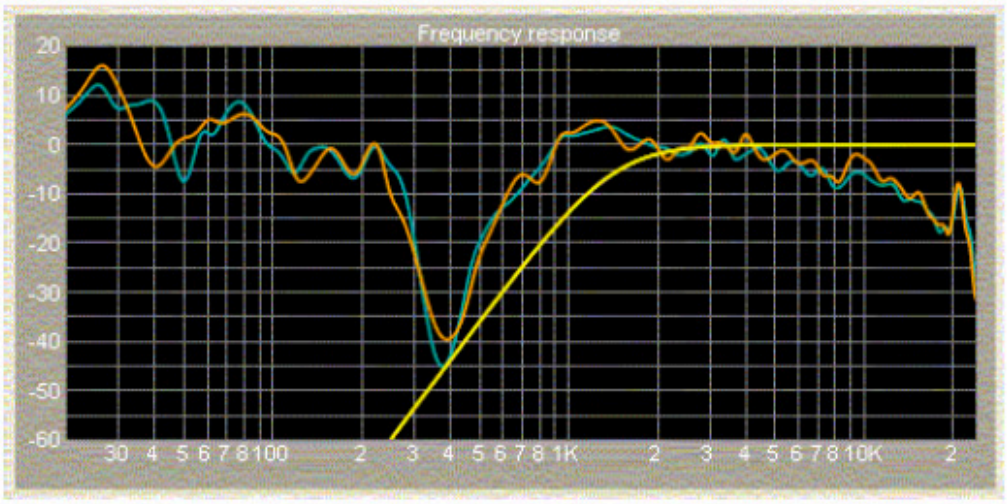


Select Save filter, choose Target memory 1 then click on Program and Program filters.

We now will create the high range filter.
In the Crossovers/Design menu click on Create new filter, choose the high and give it a name (HP4_1400 in the example).
Select a full range filter with minimal phase.



In the Crossovers/Design/Correction menu,
click on Tact time and to choose the files of measurements of the high filtered (+ low filtered).
For the high one, the default smoothing is increased with the parameters Smoothing=0,30 and Fall Off=0,75.



In order to limit the correction in the extreme highs, low-pass of order 2 with 10kHz is added.

Click on Enable Correction and choose a Manual range between 600 and 18kHz.

Normalize the filter with Link levels selected in order to have the same level on the left and on the right.

Crossover elements

Type	Freq.	Order	Response
HighPass	1400	4	LinkwitzRiley
LowPass	10000	2	Butterworth

Measurement

Data : TACS Tact Time Tact Frequency

Channel	Measurement file		Level (dB)
Left	KII\Prj\Tacs\Msr_grave\Msr_L1.tim	...	2,0
Right	II\Prj\Tacs\Msr_grave\Msr_R1.tim	...	2,0

Smoothing 0,30 Fall Off 0,75

Correction

Enable

Range Auto Manual

From 600 to 18000 Hz Transition Medium

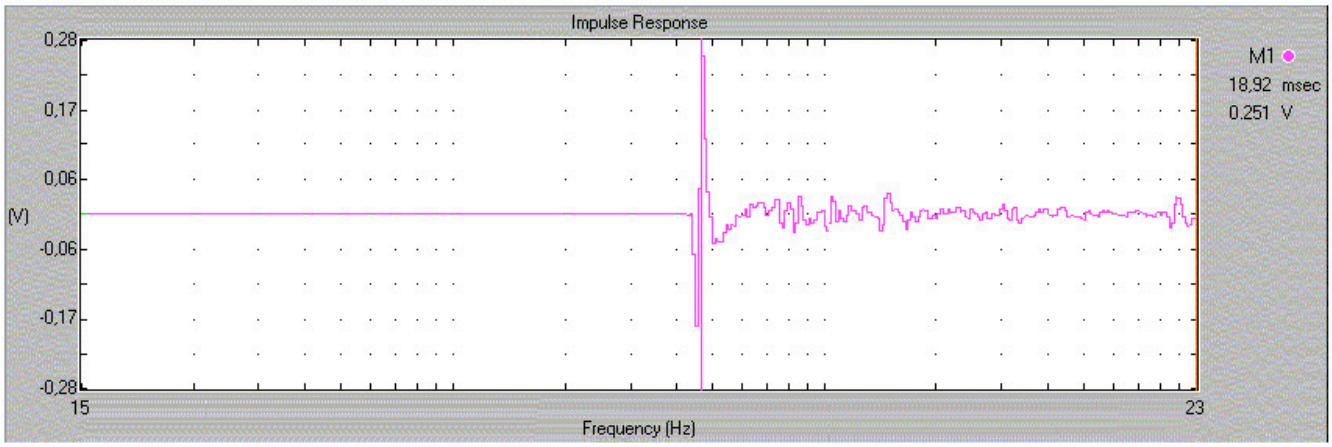
Normalize Left gain (dB) -5,2

Link levels Right gain (dB) -5,2 Calc

To save the filter, choose Target memory 1 then click on Program and Program filters.

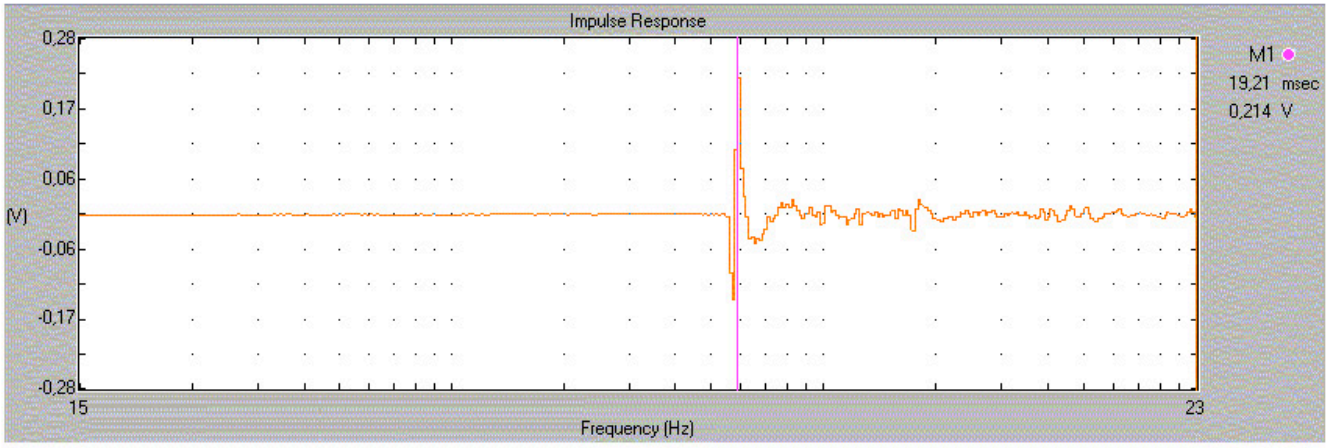
4. TIME ALIGNMENT

Software TACS associated with the RCS makes it possible to measure the response of the loudspeakers.
With the TCS, the Tact software was used.
Measure the response of the high filtered only.
In the Dual Domain screen, load the Msr_L1.tim file in Buff #1 and Msr_R1.tim in Buff # 2.
Display the first impulse response.
Select Marker M1 = Buff #1 and click on max M1.



The peak of high the left channel is here at 18,92 ms.

Display buffer 2.
Select Marker M1 = Buff #2 and click on max M1.

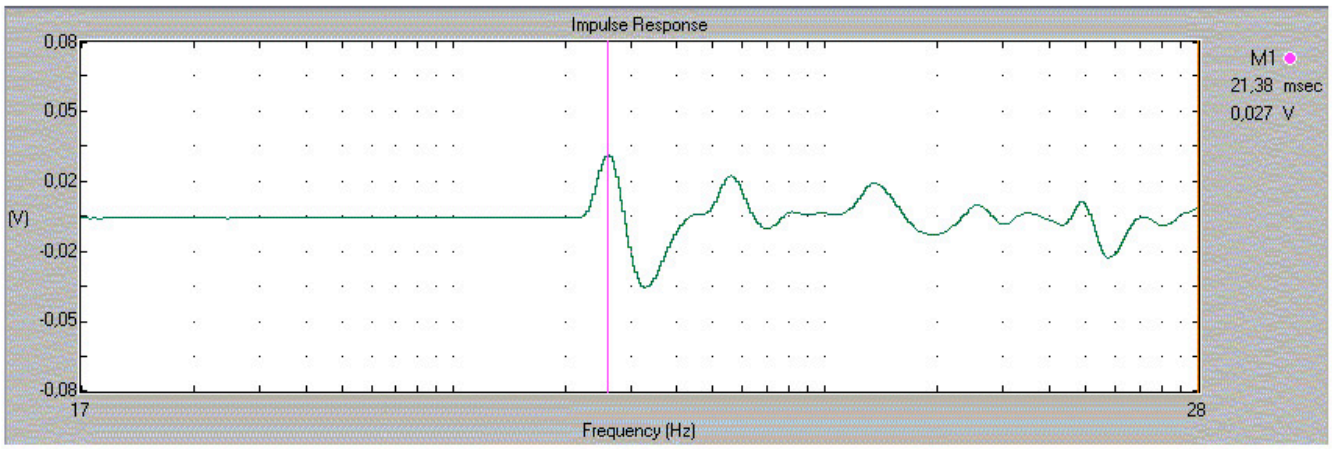


The peak of high the right channel is at 19,21 ms.

Then measure the response of midrange.
In order to obtain a sufficient noise level to allow measurement, the high range is also activated.

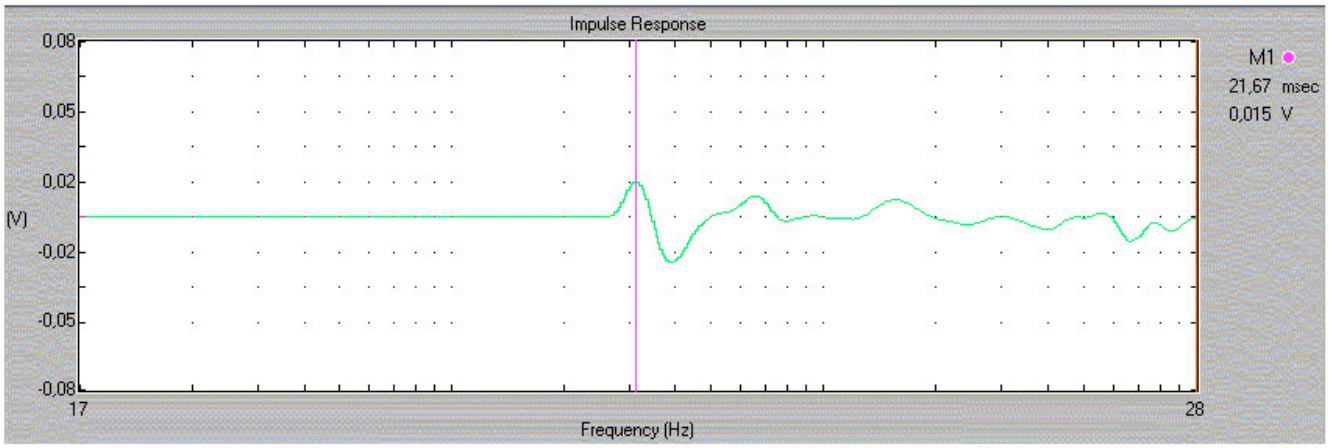
Put a time of 35ms on the high amplifier in order to identify the impulse of the midrange clearly.

In the Dual Domain screen, load the Msr_L1.tim file in Buff #3 and Msr_R1.tim in Buff # 4.
Display buffer 3.
Select Marker M1 = Buff #3 and click on max M1.



The peak of the impulse of the left midrange is here at 21,38 ms.

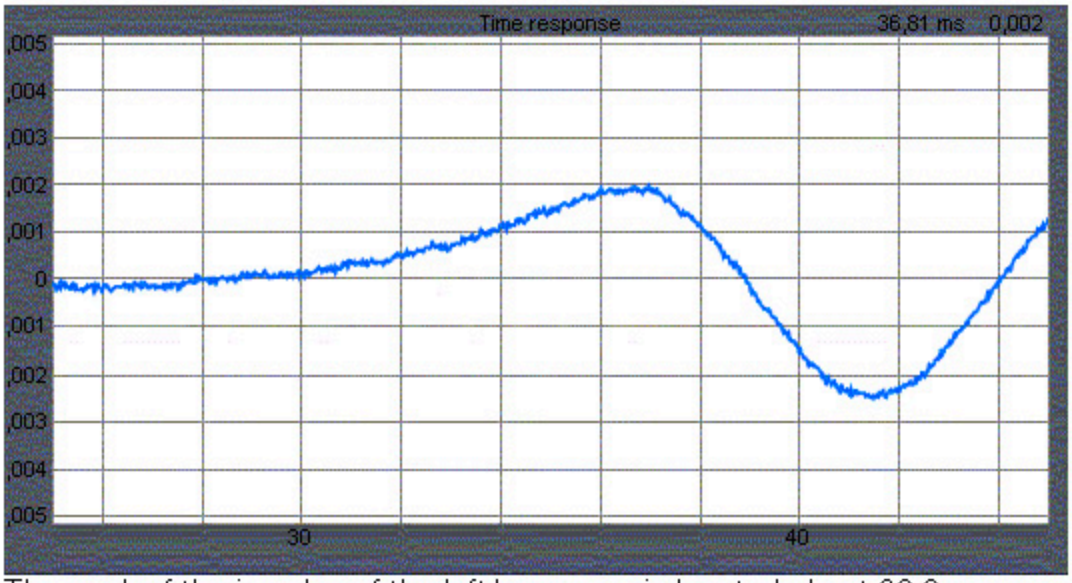
Display buffer 4.
Select Marker M1 = Buff #4 and click on max M1.



The peak of the impulse of the right midrange is at 21,67 ms.

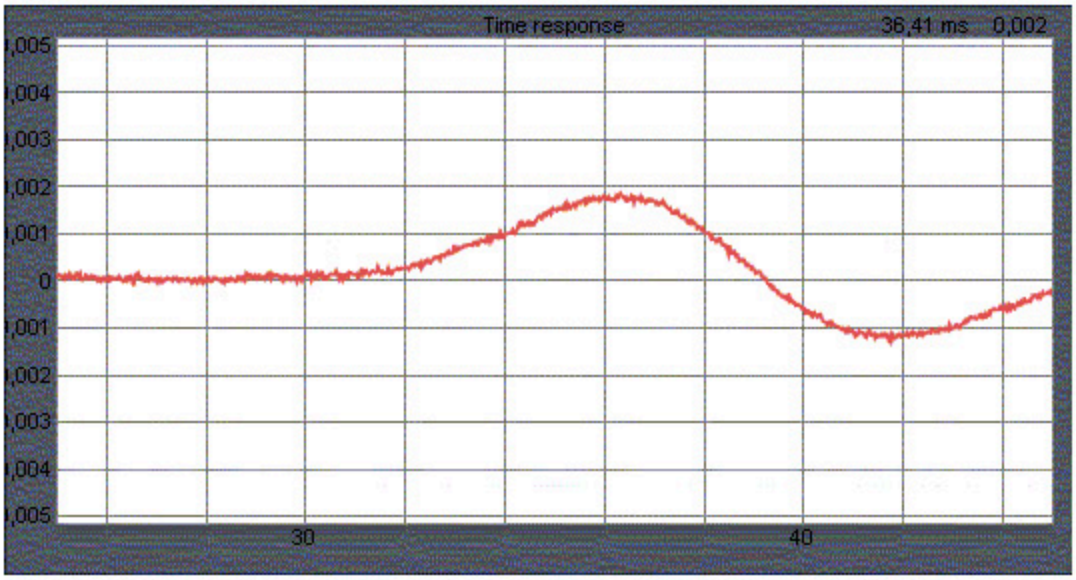
Then measure the response of the low range.
In order to obtain a sufficient noise level to allow measurement, the high range is also activated.
Put a time of 35ms on the amplifier of high range in order to identify the impulse of the low range clearly.

In the Dual Domain screen, load the Msr_L1.tim file in Buff #5 and Msr_R1.tim in Buff # 6.
Display buffer 5.
Modify the scale of time in order to allow the impulse of the low-range to appear.
Select Marker M1 = Buff #5 and click on max M1.



The peak of the impulse of the left low-range is located about 36,8 ms.

Display buffer 6.
Select Marker M1 = Buff #6 and click on max M1.



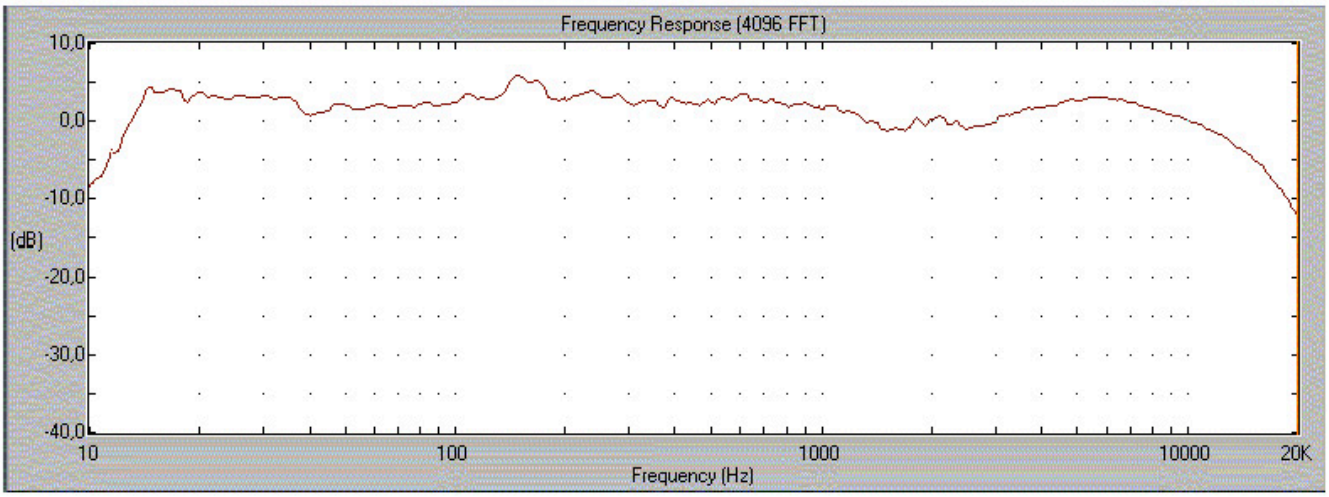
The peak of the impulse of the right low-range is located about 36,4 ms.

The impulse of reference is most distant; it is that of the left low-range located at 36,8 ms.
The other impulses are in advance and must be corrected by adding a time.

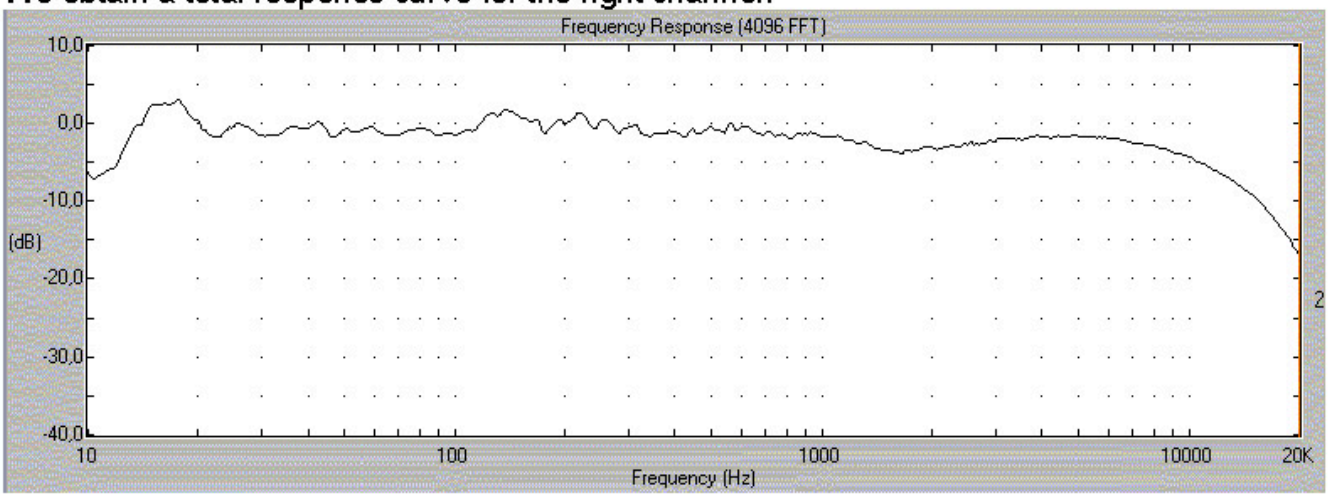
We thus add in the amplifier of high-range a delay of 36,8 -18,92 = 17,88 ms for the left channel and 36,8 - 19,21 = 17,59 ms for the right.
For the mid-range amplifier, we add a delay of 36,8 - 21,38 = 15,42 ms for the left channel and 36,8 - 21,67 = 15,13 ms for the right channel.
For the low-range amplifier, a delay of 36,8 - 36,4 = 0,4 is added on the right channel.

5. ADJUSTMENT OF THE RELATIVE LEVELS.

With the adjustments:
Low = 0 dB, Mid = -5 dB and High = -12 dB
We obtain a total response curve for the left channel:



With the adjustments:
Low = 0 dB, Mid = -4 dB and High = -14 dB
We obtain a total response curve for the right channel:



It no longer is needed to do all the correction in the preamplifier.

6. HISTORY

Rev.0f.E1: Correct translation of Francis' and Frederic's names
Rev.0f.E0: Translated to English 25/11/05 by Tip Johnson
Rev.0f: Initial edition of the 28/09/05 by Francis Brooke
http://francis.audio.monsite.wanadoo.fr/