

STORY AND PICS BY SC SOUND GUY

UNLEASHING THE POWER WITHIN

PROPERLY TUNING YOUR AUDIO SYSTEM CAN MAKE A HUGE DIFFERENCE TO THE QUALITY OF YOUR TUNES. THIS MONTH WE SHOW YOU THE INS AND OUTS OF HOW IT'S DONE

Every single quality source unit on the market is packed with tuning tools, all of which are designed to turn the mundane performance of your stereo into something truly astounding. Let's take a look at what you'll find when you dig through those menus and see how they can dramatically improve the sound of your system.

WHAT DOES ALL THIS CRAP DO?

Since tuning can be technically challenging, most manufacturers have decided to pack their sources with a bunch of preset signal processing to, apparently, make life easy for you. These include things like the 'loudness' function, 'DSP' sound curves, 'listening position' settings and other strange stuff.

The truth of the matter is that every car is different, every sound-system layout is different and every owner has a preference for what they want their system to sound like.

So, my first word of advice is to turn off every single preset signal-processing function and never turn them on ever again. The next step is to return the bass and treble controls to their zero position. From this level playing field, we can begin to build something worthwhile.

KNOW YOUR GEAR

Okay, so it is obvious the tuning you can apply is only as comprehensive as what's packed inside your source unit, and the tuning tools we'll run through here may or may not be included in your current source.

Still, these fairly advanced tools can be had in CD tuners costing from around \$599 RRP, while even less-expensive CD tuners on the market will have similar types of signal processing on hand even if it is a little more basic.

For this story, I contacted John Lalor at Alpine Electronics, who just so happened to have a VS Clubsport that was equipped with a source that not only had the tuning tools we required, but a graphic display of them via a fold-out TFT screen. This way you can get a better idea of what the tuning achieves through our images.

The source unit in question is Alpine's venerable IVA-D310E in-dash CD/DVD tuner with touch-screen monitor. The rest of the system comprised of a pair of

two-way component speakers in the front stock locations placing the tweeters at the top of the dash, rear coaxials in the parcel shelf, plus a single 12in subwoofer in the boot.

CROSSOVERS

WHAT DO THEY DO?

Crossovers are filtering networks that ensure each speaker in the system is only playing a specific band of frequencies. Tweeters play high frequencies, subwoofers handle low frequencies, while midrange speakers deal with everything in between.

Still, the type of filter used for each can be varied to achieve significant improvement in sound quality and loudness.

You can adjust a crossover filter's performance by varying either the cut-off frequency itself or the slope at which it cuts off the unwanted frequencies. This slope is expressed using the basic units of sound measurement, being decibels (for amplitude) and octaves (for the frequency).

So, a filter slope that has a 12dB-per-octave slope will diminish the signal by 12dB for every octave of frequencies either below or above the filter cut-off frequency.



GRAPHIC EQ OR PARAMETRIC (EQ)



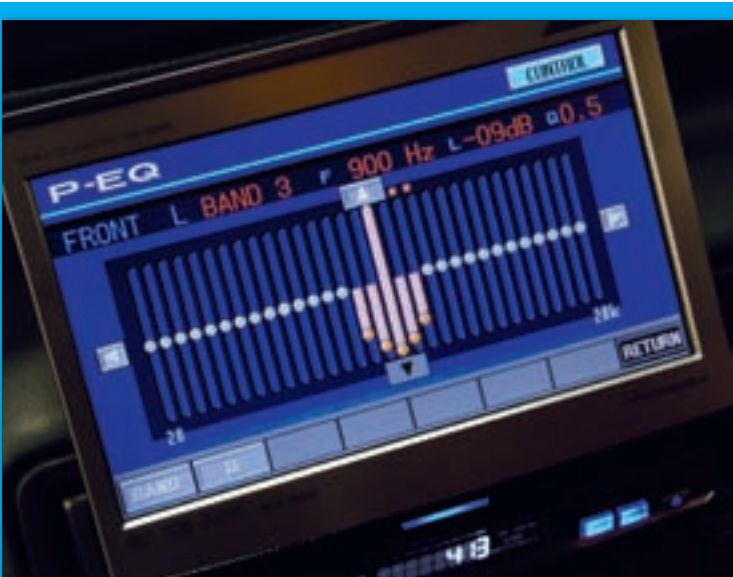
The most basic EQ is the graphic equaliser, which simply affords you a choice of two or more centre frequencies and a fixed amount of boost or cut. Most CD tuners on the market costing more than around \$300 will offer three or more bands of EQ, and the more bands you have to tune with, the more control you have.



A far better EQ is the parametric equaliser, which allows the centre frequency of each band to be varied so that you can hone in on the exact peak or dip in response and correct it more accurately.

Parametric EQs can also be 'tuned' for their boost or cut curves. Put simply, any band can be varied for the width or narrowness of its curve.

In this way, it makes sense to look at the frequency response of the system in broader chunks when tuning. That's because you may find one band of wide EQ will fix a larger chunk of the response in one fell swoop – leaving the remaining bands to contend with smaller peaks or dips in the process.



The very best parametric EQs offer independent left- and right-channel centre frequencies while affording a large variance in curve width (referred to as 'Q') and a choice of many centre frequencies. Still, even three bands of parametric EQ and a choice of around a dozen centre frequencies will be more than adequate to successfully tune most cars.

HOW DO I SET IT?

The human ear will hear peaks in response and single them out as detrimental far easier than it will discern dips in response, so it is the peaks you'll be hunting down and correcting. Play back a selection of well-recorded music tracks that you are very familiar with and have listened to on various other sound systems.

The human ear is very sensitive to upper midrange and treble frequencies, so I like to use female vocals and piano to tune my cars with since these will show up bad-sounding upper frequencies very easily.

Bass frequencies are between 20Hz and 200Hz, treble is from around 4000Hz and upwards, while midrange exists in between. The best approach is to tune one band at a time starting with the lower end of the treble spectrum at around 6000Hz.

If you can hear any shrieking in the vocals, a simple reduction of around 3dB at between 4000 and 6000Hz may cure this. If not, then simply set this band back to zero, move up to the next highest band and try the same thing. This process of trial and error by running along each band will very quickly identify where the system is sounding bad.

After you've found a good balance for the treble, then simply run through the same process for the midrange starting from around 3000Hz and heading downwards.



For lower bass EQ, things change somewhat, and I've found that instead of smoothing out response, a lot of listeners prefer to listen to a peaky response that gives you that pound-in-the-chest sensation.

For this, it is useful to apply up to around 6dB of boost at between 45 and 55Hz, though any more boost than this and you could run into a power input shortage from the amplifier.



Using a steeper slope diminishes the unwanted frequencies quicker, which may be desirable as it increases power handling and affords a greater choice of cut-off points. You'll find any source with variable crossovers will offer at least three high- or low-pass filter frequencies and possibly two or three slopes to choose from.

HOW DO I SET IT?

Each speaker in the system will need at least one filter applied to it, with the subwoofer requiring a low-pass (LP) filter, while each midrange and tweeter will require a high-pass (HP) filter.

If you have a component set with an outboard passive crossover network, it will take care of the tweeter's HP filter for you, but the midrange will still require a HP filter of its own.

Beginning with the filter cut-off frequencies, the 'crossover point' where the subwoofer and midrange intersect will likely be very close, but depending on the type and size of the speakers you use, the ideal frequency will change.



For most subwoofers, you will find that a low-pass filter set between 70Hz and 100Hz will sound best. All that's needed is to play the system at a moderate level and switch between cut-off points until you find the perfect balance of smooth bass response without muddiness while still affording strong attack and punch.

If you have a choice of a steeper filter slope, you'll likely find that a higher cut-off frequency will sound better.

Applying the HP filter for the midrange speakers is largely determined by their ability to cope with bass output. You ideally want to keep the HP set as low as possible to assist with keeping some bass presence up front. Still, as the midrange is asked to reproduce more bass, it will suffer from diminished power handling.

Again, use your ears when setting the HP filter, and so long as the speaker looks and sounds to be in control, it will work fine. A steep filter slope will have advantages by allowing a slightly wider band of frequencies to be reproduced since it cuts away the lowest bass tones quicker.

As a basic guide, a 6.5in midrange will play well with a HP filter point of between 80Hz and 100Hz when using a 12dB-per-octave filter slope and may play as low as 60Hz with a steeper 18 or 24dB-per-octave filter slope.

A 5.25in midrange will require a higher HP filter point of around 120Hz at 12dB per octave, whereas a 4in midrange will require a HP filter set at closer to 200Hz at 12dB per octave.

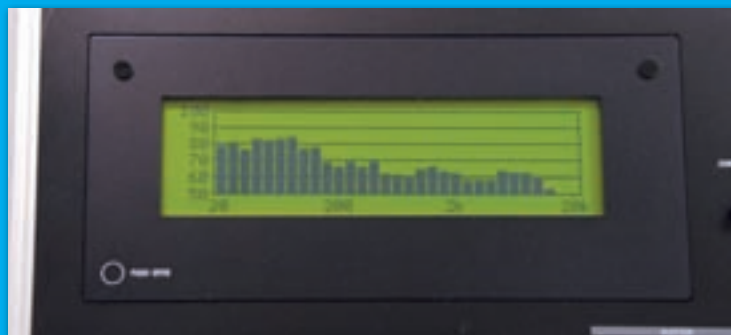
EQUALISATION (EQ)

WHAT DOES IT DO?

The key is to consider equalisation (EQ) as a frequency response correction tool, not as a 'tone shaping' tool like making a 'smiley face' with the EQ curve.

The ideal way to EQ your car is to have it measured using a Real Time Analyser (RTA) and then judiciously boost or cut the specific frequencies across the audio spectrum to achieve a smooth overall response that doesn't show any significant peaks or dips anywhere. The trouble, of course, is that few people own RTAs.

That's okay, you can do a lot of good correction by ear, but first let's look at the different kinds of EQ your source might have on tap.



Equalising to create a smooth response in the low-bass region really can't be done simply by ear, and if you are deadly serious about great sound, this would be a great time to visit your local car-audio specialist dealer. Remember, I said 'specialist'.

TIME ALIGNMENT

WHAT DOES IT DO?

The basic principle of time alignment is to achieve what the term suggests, and that's to align the arrival of the sounds from each speaker so that they reach your ears simultaneously. Since each speaker is placed at a different distance from where you sit, there is a massive sound-quality improvement to be made by doing this.



Time alignment is done by measuring the distance to the farthest speaker from the listening position and using this as a reference distance. You then use the digital delay processing of the time-alignment processor to delay the output of every other speaker in the system to match.

The best effect you can achieve with time alignment is to use it solely on the subwoofer and front speakers in a system where the tweeters and midrange drivers are powered by their own amplifier channels. This enhances the realism of the sound stage to accurately place instruments and performers across the front of the car so it sounds like a real live performance.

HOW DO I SET IT?

There are really two stages to applying time alignment effectively. The first is to align the front midrange speakers to the tweeters to create a good sound stage. The second is to then delay all of these equally as referenced to the added distance to the subwoofer, as this final stage will help pull bass towards the front of the car.



**TURN OFF EVERY SINGLE
PRESET SIGNAL-PROCESSING
FUNCTION AND NEVER TURN
THEM ON EVER AGAIN**



Begin by measuring the relative distances to each front speaker with a tape measure and record them down on a piece of paper. The furthest of these speakers is likely to be the passenger-side midrange or tweeter, and this then becomes the reference distance for the others.

One speaker at a time, calculate the difference in distance to each speaker and then add this distance of delay using the time-alignment processor. Once finished, you should theoretically have each front speaker's sound arriving at your ears simultaneously. Obviously, this can only be done properly for one seating position, but be selfish and tune it for the driver's side.



Now, measure the distance to the subwoofer including the full path length against the rear wall of the car, and calculate the difference between this length and that of the front reference distance.

The last thing to do is now add this amount of delay to what you've already added to each front speaker, as well as adding this much delay to the front reference speaker. Once complete, the front stage imaging should be dramatically improved, and bass output should sound like it comes from further forward in the car.

CONCLUSION

Tuning may take you as little as 10 minutes or as long as an hour to complete depending on how comprehensive the signal processing is on your source as well as how fastidious you are about the results.

Either way, after you've run through these basic tuning steps, I guarantee you'll have a significantly better-sounding system that will play louder, play cleaner and last a hell of a lot longer. *SC*