

“Hear out your hi-fi system”

DIY at home: A collection of hi-fi tips and hints without requiring high investments, just your time...

Version 4
By: A.J. van den Hul

A suggestion for reading:

This large collection of hi-fi tips and hints is presented in a number of bite-size parts containing mixed subjects. The first parts start with relatively easy items, and further on, the higher numbered parts also contain more difficult subjects.

Since this collection is so large, browsing through it can become confusing and overwhelming. The separation in parts allows you to read a next part upon each visit and become inspired with a new set of ideas to improve your sound quality at home.

Go to part:

[1](#) | [2](#) | [3](#) | [4](#) | [5](#) | [6](#) | [7](#) | [8](#) | [9](#) | [10](#) | [11](#) | [12](#) | [13](#) | [14](#) | [15](#) | [16](#) | [Disclaimer](#)

For those who want to search for specific ideas, a [subject index](#) is included at the end.

Tip: For easy moving back and forth through this document use your browser's "Back" and "Forward" buttons, or alternatively: the "Alt + Left Arrow" and "Alt + Right Arrow" key combinations.

Please note: Next to the hi-fi tips and hints listed in this document, many more related subjects are extensively treated in our website's dedicated Cable FAQ, Phono FAQ and "Audio and Video Cable/Connector WIRING DIAGRAMS for DIY purposes".

Part 1:

2-20 Wall reflections can cause a too wide or corrupt soundstage

A too wide soundstage most often results from having a hard and reflective wall (or other surface) at the side of one or both loudspeakers.

Hard surfaces reflect sound and can present extra mirror images of the speaker(s) at your listening position.

From your listening position you can imagine all hard undamped surfaces acting like acoustic mirrors which (dependent on your and their position) may present replicas of the speaker(s) in the form of so-called reflected or indirect sound.

Hard walls beside the speakers thus can widen the soundstage. Other hard surfaces like a ceiling or uncovered floor can distort the soundstage in other directions.

In general, the closer a hard surface is to the speakers, the stronger its reflection will be.

Placing a damping panel at the first reflection point between the loudspeaker and you as the listener on both walls is the best solution to reduce the acoustical width. The same works on hard floors (place a soft rug between you and the speakers) but also on the ceiling, a place hardly anyone thinks about.

2-7 Sound coloration; Further reduction measures

Next to asymmetrically positioning the speakers in the listening room (see [2-6](#)) you can further reduce room sound coloration by more breaking the room's symmetry and by using damping materials. I.e. (acoustically) break up all surfaces with records, bookshelves (you don't need to read the books), panels made of strips or blocks of wood in uneven configurations (diffusers) etc. Place furniture asymmetrically. Dampen with carpets, curtains, acoustic (foam) panels on the walls and ceiling etc. The more items that can break and/or dampen sound, the better. This to reduce all standing waves in your listening room, which makes the listening less fatiguing.

5-3 Cable life and temperature

For a longer lifespan, avoid running your cables near to places where high temperatures can arise, like power amplifier heat sinks or tube equipment.

1-12 Improving sound by adding weight

When you can find a pair of street tiles of 30 x 30 cm or even larger, put one under each of your speakers. And if you can manage to get another pair from your neighbour's driveway, put those on top of your speakers.

Don't forget to put some thin, flexible (and possibly sticky) sheet material in between for protecting the cabinets against scratches.

"Suddenly four tiles are missing in the street... I must say that style and respect these days are getting less and less".

For more mechano-acoustical damping tips: regarding loudspeakers see [1-13](#) and [1-16](#), regarding turntables see [9-8](#) and [9-3](#), regarding other hi-fi equipment see [3-2](#) and [3-9](#).

11-2 Buying second hand equipment is worth considering

When you need other equipment, consider to buy second hand. With mechanically critical objects like phono cartridges this is somewhat risky, but with electronic equipment it's a good option. You can buy more for less.

2-2 Good sounding equipment exhibits stable imaging

With a good sounding hi-fi set playing good CDs it should be possible to have someone standing in front of one speaker and still experience a very correct imaging. Also, even when turning the speakers sideways the imaging should not get lost.

Much more about this can be read in our paper named "A simple hearing method for audio quality evaluation".

When, however, the imaging is lost you have to do a lot of work to re-establish the correct imaging. It means changing cables and/or equipment. For this test purpose our program carries specially suitable CDs (our Van den Hul Carbon

Recordings) which exhibit very low distortion levels and superior imaging. All these recordings were made live to two-track using DVD 96kHz/24-bit technology as well as our Linear Structured Carbon[®] cable The SECOND[®] in a very natural and minimal recording approach without “black boxes” or artificial effects.

5-10 Van den Hul cable length markers facilitate the measuring of cable lengths

Measuring cable lengths is easy since all our cables are marked with a brand and type name printing at every 25 cm (10 inches).

2-14 Too much bass from bass reflex speaker system

When there is too much bass coming from your bass reflex speaker system, you can reduce the amount of bass by putting a piece of cloth (e.g. a shirt or some old socks) in the reflex port's opening. By doing this you're in fact tuning the amount of resonance in the 30 to 50 Hz frequency range by enlarging the air resistance of the port.

10-2 Making your own recordings is instructive

To learn to better understand sound and music it helps 100% to make your own recordings. Next time you'll be less critical when the CD you got from your mother in law isn't sounding up to par.

10-4 Putting sound characteristics into words is helpful

Try to describe in words the type of sound you like most, even when it does not concern your own equipment in your own environment. Being able to put sound characteristics and preferences into words is very instructive and is also helpful with sound quality evaluations. Also see our Cable FAQ's point 3-30.

Part 2:

7-2 Maintain clean metal contacts with our RCA type connectors

All our male RCA type connectors have a cut in the centre pin (*) and multiple cuts in their ground contact shell. Rotating them in the female connector every once in a while and when you plug them in cleans the contacts and will collect the removed dirt in the connector's slots. From now on you can always work with clean metal contacts.

* Remark: An exception is our The NAME interconnect, which RCA connector's centre pin doesn't have a cut.

13-2 Give your kids your old equipment to let them learn by playing

Give your children the equipment you don't use any longer. It is their entry to your hobby world. It may also save you expensive repairs of your actual equipment, because by playing with your old equipment they learn how things work.

2-15 High tones are too pronounced

When the highs are too pronounced, put the nice carpet you got from your mother in law at front on the floor. This helps to reduce the extra floor reflections so that the total level of the highs is somewhat less.

6-2 Keep interconnects and AC power cables as far as possible apart

AC power cords and interconnects are often kept very close together at the rear side of audio (and video) equipment. To minimise possible interference from the mains (and this especially when your power cords are unshielded), keep your AC and interconnect cables separate as much as you can. This also applies to your speaker and video cables. If keeping the AC cables apart is impossible, at least let them cross perpendicular. A good idea is to keep the power cords together on one side and all the interconnects at the other.

4-9 Possible sound improvement by swapping your front stage tubes

When your tube amplifier has more tubes of the same type in its front stages (*), it is well possible that the best sounding tube is not positioned at the best place (the most critical spot often being the input stage). Front stage tubes of the same type can be interchanged (with the amplifier switched off of course) and by doing this often a combination can be found which produces the best sound quality.

*: Front stage tubes like for instance: ECC 81 = 12AT7, E81CC = 6201, ECC82 = 12AU7, E82CC = 6189, ECC83 = 12AX7, E83CC = 6681, ECC85 = 6AQ8, ECC88, E88CC etc.

11-3 Try out at home first

Always ask your dealer if you can try out the equipment you want to buy in your own environment. It is better to have some discussion in advance than a big war afterwards.

2-3 The best listening position and spatial reproduction

The best listening position in your listening room is where the level of the signal which directly reaches you from your loudspeakers is stronger than (or at least equal to) all indirect sound which reaches you reflected from the walls, floor and ceiling. So you might have to move your chair closer to the loudspeakers to raise the level of the direct signal.

The criterion is to have an as good as possible spatial impression of the recorded music. Here especially the perception of depth in the sound image is essential.

For a good spatial reproduction not only the above mentioned separation in level between the speakers' direct sound and the room reflections is important. There should also be enough separation in time between the speakers' direct and the room's reflected sound reaching your ears (see [2-4](#)). Both this level and time separation are necessary to effectively allow the human ear to mask the listening environment's own acoustics in preference to the stronger and more directly

presented space of the music's recording venue.

4-2 Collect spare tubes

In general, tube equipment sounds better compared to semiconductor equipment. But tubes (notably power types) don't last that long. So collect some spare tubes when you decide to continue with your tube amplifiers.

10-3 Listening while reading the sheet music is instructive

When you listen to music at home, try to also find the sheet music. For a simple piece of music the note reading is not too difficult. Reading along while listening teaches you something more about music as a cultural gift. Otherwise it stays just as a balance between sound and personal perception.

5-18 On burning-in interconnect and loudspeaker cables (1)

New interconnect and loudspeaker cables need a "burn-in" time. Normally this is done by just playing music through them for some period of time. With good loudspeaker cables the burn-in time is relatively short. With interconnects on the other hand it always takes some more patience.

The reason is that the signal levels present in interconnects are much lower compared to those in loudspeaker cables. Also the source and load impedances used at both ends of interconnects are much higher than with amplifiers and speakers. Therefore the currents are much lower -and- the lower the current, the longer it takes.

With new loudspeaker cables, the bass should immediately be correct, for the midrange frequencies it takes a bit more time and the high frequencies are the last part to settle.

5-19 On burning-in interconnect and loudspeaker cables (2)

For both interconnects and loudspeaker cables the burning-in runs smooth with the application of white noise (e.g. from your FM tuner). This can be done at night so the next day all connections should be fine. When it takes weeks you have the wrong products in your system.

Part 3:

10-5 What time of day is best to perform listening tests?

For testing your equipment the evening is a pleasant period. But in the evening your ears are different and not as “fresh” anymore than in the morning. So, for critical tests use some time in the morning.

9-1 Many turntables don't play optimal; Simply adjusting the overhang already does a lot

Many turntables are not working proper because of incorrect adjustments. Just a precise positioning of the overhang with a cartridge alignment protractor already can do very much in the positive direction. And keep the turntable really horizontal. Measure with a light spirit level to avoid unbalance caused by its weight.

2-19 Keep your tweeters level with your listening position

In positioning your speakers always keep the height of your speakers' tweeters at the same level as the listening position. This gives the best resolution and spatial reproduction. (Also see [2-13](#)).

10-1 Train your ears by listening to natural sounds

To train your ears in listening, but also to clean your ears and sound memory from impressions left by everyday's artificial sounds, regularly visiting live concerts of acoustically played (e.g. classical) music and/or regularly making walks in nature is very helpful. (Do this with your children so they also hear and learn from you what you like).

Remember that real natural sounds have the highest fidelity which one can get. They serve as the best reference for what all hi-fi equipment at home is trying to render.

9-12 Two tips to spare your old 78 RPM records

- When you like to play old 78 RPM records with a steel stylus, change the stylus after each side. They cost about nothing and it saves your records.
 - When your 78 RPM records are often played, regularly clean them with water, soap and a soft brush to remove the residue left by stylus wear. Else the residue of the steel stylus will wear the next steel stylus even faster.
-

9-4 Warning! Never solder at your phono cartridge

When you're having the positive mental wave to connect everything by soldering (see [7-3](#) and [7-4](#)), NEVER solder any leads directly to your phono cartridge! By doing this you will automatically desolder its internal connections, with the result that I have to repair your cartridge again. So this is definitely a DON'T!

12-2 Compare with others when in doubt of a component's sound quality

In case you doubt the sound quality of e.g. your pre-amplifier, ask your audiophile friend to bring his unit. Together you can make quality evaluations to find out the truth. Also see [12-4](#).

5-4 Cable life and floor placement

Don't stand on or walk over your cables. Also avoid sharp bends or putting objects on them. Especially interconnect cables with thin internal strands can be damaged (also see [5-2](#)). With high frequency cables the characteristic impedance locally can change too. This causes signal reflections, which in digital (audio) interconnects can worsen jitter performance and in video cables will degrade image fidelity.

11-5 Standing while judging or comparing speakers yields one-legged results

In its sound character, reflected sound tends to stay in horizontal layers in listening rooms. So, standing in a hi-fi shop and trying to listen for the best speaker always results in deception.

It's best to sit at tweeter level because that's about the same situation as at home. In that way you will experience a more normal sound reproduction because you're more into the speakers' directly radiated sound field. And, equally important, there's more sound absorption (you're nearer to the carpet and chair) so the intensity of reflected (i.e. room-coloured) sound is lower.

Standing, on the other hand, very often means listening to more room coloration due to stronger reflections and less absorption. This means that you have to move closer to the speakers to find balance between their direct radiated and reflected sound.

At the lower listening position your distance can be about 20% larger to create the same sound character.

Also, already harsh sounding speakers (it can also be the CD-player, the amplifier and/or the cables (see [11-4](#)) sound worse when you stand and sound better (at a 20% larger listening distance) when you sit. Especially when other people stand around you, as is most common in a hi-fi shop.

9-2 Don't set your tracking force too high

Too heavy record tracking by your stylus kills the fine acoustic information in the groove. So don't adjust the tracking force to 3.5 gram-force to be able to track the rarely high 100 micron modulation amplitude found on only a few test records. When your tracking ability reaches 50 to 60 micron (adequate for normal record replay) with a 1.5 gram-force setting, be happy, since you don't need more. (Additional information on this subject can be found at our Phono FAQ's point 75).

Part 4:

2-13 Adjusting the speakers' pointing direction for best listening area coverage by using a beam of light

A beam of light can serve as a handy tool to optimally adjust your speakers' orientation with respect to your preferred listening area and/or spot. The light source can be an adjustable-beam laser pointer (available from our program), or similarly: a flashlight with an adjustable beam width or just a small lamp in a tube.

Placed or soft taped on top of each speaker and pointing straight along the speaker's front axis (i.e. exactly perpendicular to the front panel carrying the speakers), the light source's beam (mimicking your speakers' direct sound field) should cover your listening area and center at your head when seated in your preferred chair. Tilt the speakers horizontally (and vertically) to optimally adjust their direction.

Note: Since the directional pattern of dynamic loudspeakers is more narrow in the high frequency range, to approximate their tweeters' radiation angle, adjusting the light beam's width to somewhere around 45 degrees in practice gives good results.

5-20 Conductor size in relation to sound quality

Many audio interconnects are very impressive in their dimensions. Our finding is that normal sized (or even thick) interconnects which have thinner conductors inside (i.e. $< 1 \text{ mm } \varnothing$) mostly sound better.

In case you have to make a decision, first check the diameters of the important internal conductors. Information which you for instance can find on our website when considering a Van den Hul product.

For loudspeaker cables it's just the other way around, thick conductors being better.

2-4 Sound coloration; Keep away from walls (1)

Always keep your loudspeakers out of the corners of your listening room. Any corner produces a kind of bass-accentuated "horn" sound.

To minimise acoustic coupling with room resonances and to provide enough time delay between its direct radiated sound and wall reflections, a loudspeaker should have a free standing position without being too close to any walls or other boundaries. The same also applies to your listening position, see [2-5](#). Your ability to do so of course depends on the free space in your listening room; Maybe you have to move some of the furniture, but you will love the sonic improvements.

2-5 Sound coloration; Keep away from walls (2)

Never take a seat close to a wall as I once saw in the house of a well-known American reviewer. Such a position puts extra accent on the bass reproduction in that room. As a rule, always keep your listening position more than 1 meter away from any wall.

If you want even less room-sound coloration it's a good idea to also rotate your listening position and the speakers (i.e. the listening triangle) by 15 degrees with respect to the room boundaries. See [2-6](#).

10-9 Bad sound quality; It's not always the equipment and/or cables

In case you experience a bad sound quality, it is not always the equipment and/or cables. There are spots on this earth with a natural bad effect on sound. When you live on such a spot you are never able to get the right quality. Take another room and start again.

5-12 Interconnect versus loudspeaker cable length

If you are using high quality cables in your system, longer interconnects and shorter loudspeaker cables produce the best sound quality. If you're using lesser quality cables it's the other way round, short interconnects and longer speaker cables being the best combination. This because the greatest signal (quality) loss is at the lowest levels, rather than at speaker level.

3-1 It is better not to stack equipment on top of each other

Electrical equipment plays better when all devices are put separate instead of stacking them on top of each other. One

reason is that stacking causes extra hum due to magnetic (stray) field emission from poor quality transformers. Even the better types of transformers can produce extra hum in other equipment.

Another reason is that piling up equipment impedes the free flow of air around and through equipment, which for cooling is especially required with power amplifiers and class A operating devices. Too high operating temperatures reduce lifespan, also see [3-6](#).

12-3 Experiencing harshness of sound

When you're experiencing harshness in your sound then first try one or more of our Linear Structured Carbon[®] cables. They are not harsh at all, so when you still experience harshness of sound (harmonic, or even non-harmonic distortion) you know that it does not concern your cables. (Also see [12-4](#)).

2-12 The speakers should face towards your seating position

There are loudspeaker manufacturers who standardly advice to keep the loudspeakers in parallel with the walls of the room. As explained at [2-6](#) this is not the best practice. Try to turn the speakers slightly inwards, facing them towards your best seat (also see [2-13](#)). A speaker's frequency response is also measured this way (i.e. on axis). Why turn away some of the highs by projecting them directly into the sofa?

1-11 Improving sound by removing front covers

When your loudspeakers have soft (e.g. fabric) front covers, please remove them. But only do this when you don't have young children and/or cats playing around. Otherwise the possible damage can be larger than the increase in sound quality gained.

Part 5:

1-1 Burning-in your speakers (1)

With many speakers, the mechanical suspension of the drivers is stiffer when new than after a prolonged time of use. What happens is that the driver movements (especially with woofers) cause the suspensions' material to slowly settle towards its final mechanical properties. Breaking in the speakers (see [1-2](#)) speeds up this process, so that the moment at which the speaker's sound properties don't change anymore and remain stable is reached earlier.

1-2 Burning-in your speakers (2)

New loudspeakers often need some time to burn-in (see [1-1](#)). The best is to put your speakers face to face. Connect one in phase and the other out of phase. (The latter means that the plus lead is connected to the minus binding post and the minus loudspeaker lead is connected to the plus binding post). It is best to use a CD with pink noise (but just music will also do fine) and play loud. Close the door and pay a weekend visit to your mother-in-law who hasn't seen or heard from you for the last two years. No matter what will be said, you can keep smiling because you know that when returning home your speakers are burned-in. Of course don't overdo with amplifier power when burning-in, you don't want a burn out.

2-8 Clapping hands reveals room resonances

By clapping your hands in your listening room you can hear its resonances. Try to reduce them as much as you can (see [2-6](#) and [2-7](#)) to get closer to the recorded sound when playing music. With the help of some electronic measurement equipment you can get faster results in these experiments.

5-1 Avoid strong bending, twisting or pulling

Always avoid any strong bending, twisting or pulling of your cables. Between your equipment use cabling of sufficient length to be able to manipulate all connections without inducing any stress. Furthermore, regarding in-wall cabling: A home theater wired through small diameter electricity pipes in the wall can create a situation where the flimsy thin speaker cables have become stuck due to an unexpected twist. Don't pull, because from 5 meters of already very thin speaker cable you may suddenly create 10 meters extremely thin speaker cable. The system still works, but not the sound.

2-6 Sound coloration; Reduction by spreading room resonance frequencies

If possible, the imaginary line which runs along the fronts of the two (or outer two) loudspeakers (i.e. the base of the listening triangle formed by the speakers and your listening position/area) should be at an angle of 15 degrees with one of the walls. This really helps to "de-tune" the room in case you have a too strong and/or colored bass sound. Tilting the listening triangle's base in essence achieves an asymmetrical positioning of the speakers in the listening room. If they, on the other hand, would be placed in perfect symmetry with the walls, the speakers would invoke room resonances at the same frequencies and, with it, intensify sound coloration.

Each speaker brings about its own position related (acoustical coupling with and excitation of) room resonance frequencies. These room resonances occur in three dimensions: along the room's width, along the room's depth and along the room's height. Which resonance frequencies in the width dimension are excited, and how strongly they are, depends on the distance between the speaker and the left wall. Likewise the distance between the speaker and the floor or ceiling influences the height dimension resonances and the same goes for rear or front wall distance and depth resonances.

When a pair of speakers is exact symmetrically positioned in a room, their excited resonance frequencies are the same, resulting into a room tuning accumulated at dominating frequencies.

To break this pattern, position them with the common frontline at an angle of 15 degrees with one of the walls. This solves the problem in most cases of sound coloration. When you need more effect take a 20 degree angle. This trick also works excellent at hotel hi-fi shows where poor creative demonstrators always put everything perfectly symmetrical. Just not the right way to do it.

An additional refinement to rotating the listening triangle is to do this by moving your right hand loudspeaker forward and the left hand loudspeaker backwards. The reason is that in all (classical) music recordings, the cellos and basses are on the right hand side. By moving it forward, the right channel speaker will stand somewhat more towards the middle of the

room where it will be less able to excite low frequency room resonances and thus produce less bass colouration.

5-13 Use the better cables for transporting the lowest signal levels

Since low signal level audio is the most vulnerable, when aiming for optimal sound quality it's advisable to apply the best cables at the lowest signal levels (for instance going from your turntable to your phono pre-amplifier and from your CD player to your amplifier). This rather than choosing your best and/or most expensive cables for transporting the highest signal levels (e.g. speaker cables) and having relatively poor ones elsewhere. Also, avoid excessive lengths of interconnect or speaker cable.

11-6 Beware of used demo cables

The more cables are moved around the worse their sound will get (see [5-2](#)).

So, never buy the demo cables from the shop (available at a very special dealer price). Even refuse when you get them for free. In their life they have been used many times more than your own products.

9-20 Mind that your turntable speed setting is correct. Use a strobe disc

At the moment you bought your turntable, all speeds were adjusted to the right value.

But actually there can be a deviation. It also happened with my own turntable.

To enjoy your LPs at maximum level check if the speed is right. Many quality turntables have a pitch control.

If the player isn't already fit with strobe rings you'll need a strobe disc. We'll soon have one in our program.

1-16 Spikes or cones; A simple DIY alternative

When spikes or cones are not available you can fit your loudspeakers with round head wood screws to create the same anchoring and damping effect. To protect the object underneath, though being somewhat less effective, the screw heads can rest on metal objects like coins.

2-1 Minimise acoustic feedback to your signal sources

Always position your speakers as far away as possible from musical signal sources which are sensitive to vibration, like record players, CD, DVD and SACD players. When your speakers are too near, their induced vibrations can interfere with the devices' sensitive playback mechanisms and with it can cause anything from sound coloration to distortion.

Part 6:

5-14 General advice with loudspeaker cabling

- Keep the speaker cables (and therefore the distance between the power amplifier(s) and your loudspeakers) as short as you can. Shorter (but also thicker) loudspeaker cables allow the power amplifier to have a better control of the speakers' low frequency response and thus provide a tighter bass than with longer and/or thinner speaker cables. (I. e. a lower cable series resistance yields a higher damping factor).
Keeping the speaker cables short means putting monoblock power amplifiers in the vicinity of, or on top of, the speaker cabinets (i.e. vibration isolated on the tile mentioned at [1-12](#)) and putting stereo power amplifiers in the middle between. If, as often is the case, keeping the loudspeaker cables as short as possible means that your interconnects are required to be longer, then please accept this as a must. The sonic improvements are worth it (also see [5-12](#)).
 - It is advisable to keep your left and right channel's loudspeaker cables about equal in length; This way the cable's impedance is the same for both channels.
Large differences in cable length may cause a noticeable distinction in sound between the left and right channel's speaker. If such length differences are unavoidable, equalizing the series resistance in both speaker channels will help (see our Cable FAQ's point 4-5).
 - It is better to run your loudspeaker cables as straight as possible from amplifier to speaker. If your speaker cables are too long, avoid coiling/looping the excessive length, meander it instead. Loops form a pick-up coil; An effective way for interference to find its way into your system.
 - Whenever possible keep your loudspeaker cables (but also your interconnects!) separated by some distance (at least 10 cm (4")) from - and avoid running them in parallel with - your mains cabling (also see [6-2](#)).
-

8-4 Power all equipment from a single wall outlet

It's best to use one single wall outlet to power all equipment by means of a multiple socket mains distribution board. This avoids large ground loops along the interconnects and the power cables. The power amplifiers must be connected as close as possible to the mains input of this connector block. The lower power consumption equipment can be connected more to the other end of your mains connector block.

11-1 Sound quality is more determined by system composition than by money

The total capital invested in your hi-fi set in itself does not say anything special about the sound. It is the composition of all parts forming the chain that creates the quality. When you're smart, you often can do better with less money (this paper's collection of tips and hints also serves that point). The part of the equipment's investment of which you afterwards may come to the conclusion to have been superfluous then well can be considered to have been your course fees.

10-7 Keep in mind that many digital recordings have been manipulated

Keep in mind that many or practically all current recordings are digital recordings with which it does not matter that much how the life sound was (especially with pop music). Nowadays everything can be manipulated or reconstructed to let it sound like magic.

5-11 On the choice of cable length regarding change of connectors and/or frequent use

Never make (or buy) your cables too short. When e.g. after intensive use you want to change your connectors, it is easier to start with a fresh cable end by removing a short length. It is also better, because, during their use, cables are most often bent close to their connectors and the cable's internal strands may have been exposed to stress there. Removing some length will make more sure that you start at a point where the internal strands haven't been exposed to stress before and are less prone to break.

13-6 Good hi-fi equipment doesn't only come from one country

When you regularly read American hi-fi publications, you'll mostly come across articles about American equipment. But this doesn't mean that there's no good European or Japanese design available. In non-American countries, readers often have the impression that only American equipment is the top. This is a mistake.

2-9 Near-field listening reduces perceived amount of room coloration

When you're able to reduce the distance from the loudspeakers to your listening position, you automatically reduce the perceived amount of room coloration. (The effect at least gets less and that's what you want). Electrostatic headphones like the fabulous Stax series are doing exactly the same. The closer to the ear, the less room coloration. Experiment but don't exaggerate.

5-23 Standard supplied cables often don't match the equipment's quality

When buying better quality (or even high-end) audio and A/V equipment, the standard packed cables seldomly are of matching quality. So don't expect top quality sound with all components put together like some 321 sets do suggest you. Experimenting with cables from other brands can help you to get a better result.

2-11 Equal distance listening position

Measure the distance between your listening position and both of your speakers. As a first requirement for optimal stereo imaging and spatial reproduction, your distance from both speakers should be equal. Mark the loudspeaker's positions and pointing directions on the floor so that after room cleaning (which always happens without any notice) you can quickly return to the original situation.

5-2 Cable life and bending

Try to avoid sharp bends in - or often bending of - any metal cable. Heavy and frequent bending induces a change in the conductors' crystalline structure by displacement and fracture of their metal crystals. This gives rise to increased Cross Crystal Distortion (CCD, also see the "Carbon & Hybrid Technology" paper available on our website), causing your audio system to gradually lose its natural clarity and starting to sound harsh.

Although in our HYBRID cables the metal conductors are embedded in a Linear Structured Carbon[®] layer which is able to bridge crystal defects, it is of course still advisable to handle your cables with care.

Part 7:

10-6 On reviewers' opinions

To value a reviewer's opinion about audio equipment it is important to know what other test and reference equipment he/she uses. The findings of reviewers who always use the same set of equipment, never switch between components and never improve their reference set are not a serious reflection of their research for better sound.

12-1 Hum; How to avoid

An important source of hum are transformers, especially unbalanced constant voltage transformers/power stabilisers. So avoid the latter whenever possible.

Keep in mind that transformers work by building up an internal magnetic field. But... these wonderful fields tend to also radiate from (non-toroidal) transformers. They can penetrate the circuitry of the next amplifier and induce hum. (Here, due to their high signal gain, especially phono pre-amplifiers are sensitive). So don't pile up equipment (also see [3-1](#)), but reserve space with enough distance between your devices. Try to keep your interconnect cables well away from transformers and (unshielded) mains cables (see [6-2](#)). Also, do not loop cables which have excessive length. Loops form a pick-up coil; An effective way for interference to find its way into your system.

A special source of hum can be the environment of a phono cartridge: Serious attention must be given to ground loops built along the ground lead of the phono cartridge. And make a separate grounding for the arm and the rest of the turntable, thus again avoiding another ground loop. So, keep the tone arm electrically isolated from the rest of the (metal) turntable. (Also see our Phono FAQ's points 48, 126 and 130).

Take care of the proper ground connections at the rear of your amplifier(s). Keep them clean and when necessary use "The SOLUTION", our contact fluid.

There must always be a good signal ground connection between all equipment to ensure a correct signal return. When something is wrong there, you have hum!!! Try finding the culprit by swapping interconnects and using logic. Measure suspect candidates with an Ohm meter, checking for (intermittent) shorts between and interruptions in the signal and ground lines. Also verify that the cable is correctly wired; See the "Audio and Video Cable/Connector WIRING DIAGRAMS for DIY purposes" available on our website.

It is furthermore very important that all equipment receives its power from the same mains socket (also see [8-4](#)), this to ensure that all equipment is connected to the same ground point. By feeding all equipment from one socket, you avoid another huge ground loop in your listening room and with it another potential source of hum. Regarding hum problems caused by antenna, cable TV, set-top box, video recorder, satellite receiver or computer sound card connections also see our Cable FAQ's point 5-11.

An additional measure to further reduce hum is to minimize the residual ground currents flowing along your interconnects, see [8-5](#).

11-4 When evaluating new equipment take your own cables with you

In case you intend to buy new equipment, take the cables you are used to with you. Otherwise too many items change and you can't recognize - or stated better - you can not interpret the new sound anymore. Judging new equipment like speakers and amplifiers while using your own cables makes a decision somewhat easier.

10-10 The FIRST[®] Ultimate Rings; A different approach to neutralize soundstaging problems

The application of our The FIRST[®] Ultimate Rings on critical spots always produces a better soundstage.

The FIRST[®] Ultimate Rings are to be positioned at specific places in the room and on the equipment.

In a while I will write a separate article about this project.

3-2 Damping mechanical vibrations improves depth and resolution in replay

However strange the suggestion may sound, having your electronic audio equipment well isolated from the environment against mechano-acoustical vibrations improves depth and resolution in replay. So put your power amplifier(s) on a solid, heavy plate (e.g. MDF wood) and isolate this platform against vibrations from the supporting surface with soft rubber cones (the rubber should not be hard). Do the same with your CD player and pre-amplifier.

A sturdy audio rack system can also do a lot in the good direction. (You can even make racks yourself: a good training subject for welding and making lead shot or sand filled tubes).

Furthermore, either in addition to having your equipment on separate platforms - or instead of (if you want to keep things more simple) - adding extra damping weight in the form of e.g. a bag of canary/birdcage sand on top of each device also yields positive results.

For more mechano-acoustical damping tips: regarding turntables see [9-3](#) and [9-8](#), regarding loudspeakers see [1-12](#) and [1-13](#).

9-3 Use a thin and supple tone arm cable

The rather rigid and thick tone arm cable, which standardly is supplied with many tone arms, in essence forms an unwanted path along which mechanical noise can be transferred to and be picked up by your cartridge. It is better to replace a stiff tone arm cable by a thin and supple one which maintains a low parasitic capacitance and a high shielding factor.

Especially designed for this purpose our program carries the D - 501 HYBRID, its silver core version the D - 501 SILVER HYBRID and its twin version the D - 502 HYBRID. These supple tone arm cables absorb and damp vibrations, thus reducing the amount of external mechano-acoustical energy going to your turntable and its further amplification. They are an excellent extra help in keeping the external acoustical environment separate from your turntable.

12-8 A trick to heal older speakers with decentered cones from their buzzing or rattling noises

Older loudspeakers can suffer from decentered cones. The (gravity sagged) voice coil tends to touch the magnetic poles during playing, giving a buzzing or rattling sound.

Repairing drivers is a special art, but there's a simple trick: when turning the speaker upside down in its box (i.e. remount rotated by 180 degrees), gravity will pull the voice coil and cone in the opposite direction.

It takes the speaker's suspension some time to settle but after a while there's a good chance your rattle will be gone.

If, on the other hand, the noises are caused by the speaker driver having been heavily overloaded, there's little chance that the above remedy will work. The cone can have become too strongly decentered and/or the voice coil's winding can have been become damaged. In this case reconing the driver is often cheaper than buying a new one, see [12-6](#).

2-10 From point receiver to point source...

A loudspeaker should ideally be a single-point sound source because the corresponding recording microphone was a single-point sound receiver. Any extended and/or big front panel constructions behave just the opposite (*). They create their own impressive sound but move away from the ideal situation: From point receiver to point source.

* Remark: There are exceptions; Despite having a large front panel, the Quad ESL-63, -988 and -989 electrostatic speakers for instance behave as a point source, producing a spherical sound-pressure pattern.

5-22 Keep speaker cabling consisting of discrete wires pairwise twisted

If your loudspeaker cabling running from your amplifier(s) to each speaker or speaker section consists of discrete wires, always twist the plus and minus line of each individual functional pair together with 3 to 5 turns per meter. This reduces the magnetic loop area formed between the lines of each pair, which has three benefits:

- It reduces possible pick-up of radio frequency interference (also see [5-7](#)).
 - It reduces the mutual induction (crosstalk) between functional wire pairs.
 - It helps the top-end response of your loudspeakers since each wire pair has less series inductance.
-

5-7 Radio frequency interference problems

Blessed as we are with an ever increasing amount of wireless equipment in our environment, there's a chance that you're experiencing noise interference on your hi-fi system. (And who has not heard his mobile phone making a rattling sound on some hi-fi's speakers?)

A first defensive measure is to reduce the loop area formed between the left and right lines of all your interconnect cables as well as the plus and minus lines of your loudspeaker cables (if they consist of separate wires) by twisting them together with 3 to 5 turns per meter. Loops form a pick-up coil; An effective way for interference to find its way into your system. Other defensive measures are also mentioned in our Cable FAQ's point 5-7.

Acting as antennas, unshielded speaker cables often are the most vulnerable point at which high frequency interference

can penetrate into your audio system and become audible. In such cases it's best to use shielded loudspeaker cables, like our The SUPER NOVA or The INSPIRATION HYBRID.

A second vulnerable point lies with the hi-fi system's interconnect cables. When their shields are not dense enough and/or are not properly grounded, high frequency interference can enter. To avoid such, look for heavier shielded interconnects (which for this reason most Van den Hul interconnects are). Another step further is to switch to balanced cabling and equipment (see [5-8](#)).

Part 8:

3-6 Extra cooling can help extend amplifier lifespan

A lower working temperature extends the lifespan of your power amplifiers. Adding some extra cooling with e.g. a small fan can do miracles. Also see [3-1](#).

1-5 Bi-amping

Regarding quality improvements, bi-amping goes one step further than bi-wiring:

In addition to separating each speaker's low and mid-range/tweeter sections drive currents by using dedicated wiring (as in bi-wiring, see [1-3](#)), bi-amping also involves using separate amplifiers (or amplifier channels) for driving each speaker section.

There are many ways in which this can be implemented. What always works is to get a second stereo power amplifier identical to the one you already have. With each separate stereo amplifier then use e.g. the left channel to feed the bass section of one speaker and the right channel to feed the mid-range/tweeter section of the same speaker. Both inputs of stereo power amplifier A (which drives the left speaker in bi-wired mode) are connected to the music signal source's or pre-amplifier's left channel (e.g. by using a y-link cable). Likewise for amplifier B and the right channel.

As a rule most amplifier power goes into driving the low frequencies, and since with this way of bi-amping each stereo amplifier drives just one speaker's bass section, the power dissipation of (and with it the heat produced by) the amplifiers' end stages is also reduced. A lower temperature and smaller temperature fluctuations mean a longer lifespan.

9-6 Phono cartridge impedance matching transformers

Input transformers used with phono cartridges to match their impedance (i.e. moving coil / step-up transformers) produce a different sound than electronic circuits. The extra magnetisation noise added by the transformer core (Barkhausen noise) smoothens the sound but, due to the noise's masking effect, also takes away some of the resolution, thus imposing a limit. The extra quality of your cartridge is lost in the transformer noise.

12-7 Distortion from home-burned CDs

It regularly happens that home-burned CDs start to distort after 35 to 40 minutes of playing. This is not your CD player, the problem comes from the burning process. Most probably the CD did not get positioned perfectly, the CD was not mechanically balanced and/or the burning speed was chosen too high.

During burning (and of course also during replay) the laser runs from the inside of the disc to the outside. When the CD wobbles, its vertical movements are larger near the outer edge of the CD. There (and especially at higher burning speeds) the burner's control mechanisms (servos) have to work harder to keep the laser beam into focus with the CD's surface and errors can occur. Burning at slower speeds often solves the problem.

1-13 Cabinet resonances

The reproduction quality also involves all mechanical vibrations and resonances of the loudspeaker box itself. Internal reinforcement of the speaker cabinet with crossbars and lining the panels with sticky bitumen will also help to realise less sound coloration. Here, listening with a screwdriver, mechanic's stethoscope or inductive probe (see [1-14](#)) will give a good impression of the sound radiated by the speaker cabinet's panels. Placement on spikes or cones also adds damping (see [1-16](#)).

13-3 The quality of some Super Audio CDs is less than supposed

When one or more of your Super Audio CDs don't sound better than the same (and much earlier released) recordings on CD, it may well be that many years ago the original recording was made in PCM (= CD) format and that the same digital master tape (i.e. not a new recording of the same piece of music) has been used again to make the "new" SACD from. Compared to the standard audio CD, the SACD's digital DSD format/system does offer the benefit of avoiding the nonlinearities caused by the AD converter upon recording and by the DA converter upon replay, however, when a SACD has not been recorded directly from analog but has been digitally converted from a CD's 16 bit/44.1 kHz digital master tape instead, the SACD can not sound better or more accurate than the original CD. The digital conversion can not add

information and even loses a minute amount. But with the help of extra digital processing one can add more space (extra time delays/reverberation) or more resolution (extra accent on the highest octave).

So if you have good old recordings on CD and expect that the same will sound better on SACD, it is worth beforehand reading the booklet and find out how the SACD has been made. The SACD will almost certainly sound better than the old CD if it has been made from the original analog master tape. If in doubt you can always listen first.

Of course there's nothing wrong with new recorded SACDs.

4-4 Longer tube life by better preservation of the vacuum inside

A better preservation of the vacuum inside your tubes (or what's left of it) can be reached by applying our The SOLUTION protection fluid to their pins. This especially at the small areas where the pins exit from the glass bulb. Minuscule cracks in the glass at those points are the major reason for vacuum loss.

With The SOLUTION applied at their bottom and to their pins, most tubes (especially the 6C33) will have a much longer life: Any micro cracks developing in the glass at the pins due to thermal expansion effects become filled and sealed permanently. Inward diffusion of gas is effectively restrained.

While you're applying The SOLUTION to the tube pins, don't forget to treat the tube sockets' contacts as well: The SOLUTION also helps to prevent oxidation of the female contacts in the hot tube socket.

9-7 A simple method to listen to the resonances in and around a turntable

The mechanic's stethoscope with a probe tip on top which you may have bought for panel resonance evaluation of your loudspeakers (see [1-14](#)) can also be used very well to listen to, analyse and neutralize your turntable's mechanical vibrations. (You can also glue a tiny probe magnet to a critical spot and hold a MM system - without replacement stylus inserted of course - or some other pickup coil as close as possible to this magnet).

With the probe you will hear all the sound running around in your turntable. The more you hear, the higher the level of the around going signals is, and with it the level of mechanical vibrations returned to the record and cartridge. The latter cause sound coloration during playback. The probe will help in working on the reduction of mechanical energy running around in your turntable. Regarding this our Phono FAQ provides more useful information. Please refer to its "Turntables" subject index section.

12-5 Dented speaker dome; Popping back out

A dented soft speaker dome (dust cap) can be popped back out by using the vacuum cleaner. Be very careful: do not directly touch the dome with the hose, keep a distance of 3 to 5 cm and, if possible, hold back the speaker cone with your fingers to avoid damage through excessive cone excursion. With a vacuum cleaner the forces however are difficult to control.

If the dome is soft, an alternative approach is to apply a "sucking kiss" either directly with your mouth or through a tube. And if the dome is made of plastic (not paper) you might also try to use the adhesive side of tape to pull the dust cover back out while holding the speaker cone back with your fingers. Metal domes however are almost impossible to restore.

12-6 Damaged woofer; Reconing is cheaper than buying a new one

A damaged woofer can be reconed by experts. Experts specialized in reconing can be found in every country. Some large (mainly PA) speaker brands also have special reconing sets available. With such a set, reconing a damaged speaker yourself is not too difficult either.

Anyhow, reconing is less expensive than buying the same driver new.

Part 9:

12-4 Play back at low volume level lacks detail / Finding the culprit by method of elimination

With a good sound system, you should be able to play at low level and hear everything. When you're having to play loud to hear some detail, it simply means that there is something wrong in your audio system. Possibly just one component is the evildoer. If you suspect one specific component you can compare it with a friend's one (see [12-2](#)), otherwise you can use the following method:

Finding the culprit by method of elimination:

Also applicable to many other sound problems (e.g. hum (also see [12-1](#))), finding the culprit can best be done by using the method of elimination: Start with a minimal system and unplug all unused components (including power cables and interconnects). Try swapping components (including interconnects and speaker cables) and, by subsequently adding components, gradually work your way up back to your full system. Somewhere along this process you should suddenly start to hear a notable change, thus having found the problem. But don't forget that also external sources of interference (e.g. AC mains, power tools, electric motors, household appliances, fluorescent lamps, wireless equipment etc.) can be the cause of problems. Also see [5-7](#), [6-2](#) and [12-1](#).

(If impossible to find the culprit inside the audio system itself, mentioned external sources of interference should be included in the elimination procedure. Here it may be useful to know that at night such sources in general are the least active).

3-9 A suggestion for pre-amplifier vibration damping

When external mechanical noise is too critical for your pre-amplifier you can hang it from your ceiling by flexible strings. In this way you isolate the unit from mechanically transferred vibrations. Adding mass to the suspended pre-amplifier (like a heavy brick or tile) will do even better. So e.g. connect a tile with strings to the ceiling and put your pre-amplifier on top of the tile. Result: Extremely quiet sound without extra sound pick-up. (Also see [2-1](#) and [3-2](#)).

9-19 Cartridge setup needs to be done in the right order

Mechanical adjustments during cartridge setup need to be done in the following order:

1. Azimuth
2. Overhang (*)
3. Tracking force
4. VTA
5. Anti-skating

*: We supply Acrylic overhang adjusters with markers and a mirror coating.

13-5 A tip for a superb broad spectrum applicable lubricant

Our company has two new types of oil in the program: TLF I and II (The Lower Friction). Super oils for all types of bearings like your record player platter bearings, tone arm bearings, CD player spindle and laser support. Also the chain of your racing bicycle runs much smoother and not just a bit... The petrol consumption by my car reduced by more than 10% after doping the regular motor oil with 20% TLF oil. Your electric shaver runs smoother and faster, the vacuum cleaner makes less noise and the fan of your air conditioner doesn't wear and even produces less noise. Your creativity is the limit of our TLF oil's applications.

8-5 Lower your noise floor and open your sound by reducing unnecessary ground currents

To reduce the ground currents which flow along your interconnects and thus lower your noise floor, next to powering all equipment from a single wall outlet (see [8-4](#)) you can further optimise your equipment's mains plug polarity positions. For this purpose we have a special POLARITY CHECKER in our program. (When all equipment is already connected to the

extra ground connection pin (the third pin) at your mains socket, skip the next paragraph which gives a short description of how to minimize hum using The POLARITY CHECKER). For a more detailed version see its manual available on our website.

Disconnect all equipment from each other, and then, with each separate audio device in your installation: First connect to mains. Then, with our The POLARITY CHECKER, measure the voltage at audio ground somewhere at the rear panel. Then reverse the 2 mains leads by rotating the mains plug. When this is not possible, like in the UK, then open the mains plug (unplugged!) and reverse the mains wires. Close the mains connector and measure again. The mains plug position which gives the lowest reading on the scale of our The POLARITY CHECKER is the best. This means that after you have gone through this procedure with all equipment involved, the ground leakage currents running along the interconnects' shields or ground leads are at the lowest level. This action takes about 5 minutes. It reduces the hum and noise level markedly and results into a cleaner and for sure more spacious sound.

9-16 Keep turntable bearing noise down; Check the platter bearing's steel marble

Older turntables always have a steel marble somewhere at the bottom of the platter's bearing. Replacing this steel marble by a fresh one (and refreshing the oil, see [9-14](#)) will help to reduce spindle noise. This especially when it concerns older Thorens players: Their oil was so aggressive that the originally shiny steel marbles came out of the bearing with a mat and dark grey colour.

1-7 Internal wiring (1)

A better sound can be obtained from your loudspeakers by removing the manufacturer's often economically chosen internal wiring and replacing it by a better type, like the AWG 12 types of our CS (or even better) SCS series.

1-8 Internal wiring (2)

Don't go nuts with your internal wiring: Inside the speaker avoid all mechanically made electrical contacts like clip-ons and screw connections (e.g. at the binding posts) by directly soldering the internal wiring. (Mind not to melt the binding posts' plastic). For some soldering tips, see [7-5](#).

1-9 Internal wiring (3)

The often flimsy thin tracks of the crossover filter's printed circuit board can be upgraded by soldering the same higher quality conductors (as used for replacing the other internal wiring mentioned at point [1-7](#)) on top of them. Fully strip them before soldering, otherwise it becomes dirty business. For some soldering tips, see [7-5](#).

9-13 Capacitors parallel to the M.M. or M.C. input of pre-amplifiers often are unnecessary

Many M.M. (Moving Magnet) input stages in pre-amplifiers use extra capacitors across the input to correct the high frequency response. Many designers forget that the phono cable itself already is a nice capacitor of 100 pF or more. So a lower input capacitor value setting or even using no input capacitor at all is the best decision.

It's also very common to use capacitors connected in parallel to the input of M.C. (Moving Coil) input stages. In rare occasions it will work, but in many situations this is nonsense because a capacitive load also creates a phase shift even before there is any fair correction of the frequency response. So set the input capacitors to zero and listen even more happy. Also see our Phono FAQ's points 38 and 91.

Part 10:

1-6 Loudspeaker bi-wiring and bi-amping cable advise

Bi-wiring is advisable (also see [1-3](#)). Because the production quality of our twin-lead loudspeaker cables is very consistent, we advise you to combine for example The MAGNUM HYBRID with the D - 352 HYBRID or the CS - 122 HYBRID.

The D - 352 HYBRID can be combined very well with the CS - 122 HYBRID, The ROYAL JADE HYBRID or The CLEARWATER. In our product range we however also have special quadruple lead bi-wiring loudspeaker cables available.

When bi-amping (also see [1-5](#)) our above mentioned cable types of course are also equally applicable.

When bi-wiring, always make a good electrical connection between the two cables at the power amp end and if possible solder them together.

When bi-wiring or bi-amping keep the two different twin-leads separated by some distance to minimize their mutual electric interaction.

9-11 A record platter made of steel is not ideal

If your record player is equipped with a platter made of steel (or iron), it will always attract your cartridge to some extent due to the cartridge's emitted magnetic field. (You can of course check the platter material with a small magnet - preferably held near the platter's rim to avoid possibly magnetizing the play area).

If, during replay, the distance between the cartridge and platter changes (or if the platter has magnetic spots), this attraction force will vary considerably. So, with warped records there's always a strongly modulated tracking force, causing related tracking problems. It is therefore better to change your platter as soon as you can. Change it by a brass or even a pure copper type, made by a friend handy in metalworking. In case you don't have friends, you can also use some old vinyl records as a replacement for the iron or steel platter. But mind that flat records here of course produce a better sonic result than warped ones...

10-8 Recordings made through computer sound cards often are no good reference

The AD (and DA) converters found on computer sound cards work but don't expect a high-end quality from most of them. So, decisions taken based on a CD burned from a connection to the analog inputs of your computer's sound card are not a good reference for sound quality evaluation.

5-8 Balanced is better

When possible, always use balanced connections. From many years of experience I can tell you that balanced equipment at least sounds equal to unbalanced, but in most cases much better, especially when the signal level is very low like in turntable and tape head connections. Better here means: higher resolution, more air and space and the instrument separation is higher. Also the acoustics of the recording space are easier to hear. So focus on balanced. It may take several years before your equipment collection is complete, but the result is worth the investment, especially in an environment blessed with spurious high frequency signals (which sources nowadays are ever increasing). With balanced connections (i.e. having XLR type connectors at the cable ends) the signal Live and signal Return are both shielded, whereas with unbalanced connections the signal return is also the shield. And it is there where the problem starts (see our Cable FAQ's point 6-9).

5-21 How to provide your speaker cables and interconnects with extra corrosion protection

To extra protect your loudspeaker cables (especially when they are insulated with PVC (see [5-5](#))), take a syringe filled with our "The SOLUTION" protection fluid and regularly inject the vertical hanging cables from the top. After some shots and time the fluid will cover all conductor strands throughout the cable. The same can be done with your interconnects. The SOLUTION will keep your cables in good condition by coating the conductors' strands, sealing the internal world of the cable off from the external world.

2-18 Sound coloration; Dealing with a "boomy" sound caused by room resonances

A "boomy" sound is not always produced by your loudspeakers themselves. The speakers namely can excite lower frequency room resonances which tend to be less well damped (i.e. having a Q-factor of 0.7 and higher).

Next to keeping your loudspeakers out of the corners of your listening room (see [2-4](#)) and not having your listening position close to any walls (see [2-5](#)), points [2-6](#), [2-7](#), [2-9](#), [2-14](#) and [2-17](#) mentioned elsewhere in this document all positively contribute in reducing the problem. Though the most direct and effective approach is by damping the room resonances themselves:

Adding acoustic damping materials (e.g. foam, pillows or soft furnishing), especially in the corners of the room (*), will produce immediate results.

*: Note that corners where 3 planes meet are the best places to start. Adding damping material here affects resonances in all three room dimensions simultaneously.

Since most ceilings provide little acoustic damping, it's usually best to start (at the four corners) there. If necessary also treat the floor's four corners. The more damping material, the lower the bass Q.

2-16 Combining multiple small speakers

When you have relatively small loudspeakers, buy another set and put this second set upside down on top of your first set. (I.e. with the tweeters nearest to each other and symmetrically between the woofers). This creates a kind of D'Appolito configuration. When you can buy 2 sets more, create a 4 loudspeaker array per side. Turn them all slightly inwards so you face each of them. You will not believe your ears.

7-9 A word on analog and digital video connections

In analog video signal transport the three-wire component video connection (like our The COMPOLINK 75) is still the best, especially when longer distances (above 5 meters) are concerned.

The currently strongly promoted HDMI connections often suffer from crosstalk in the cable itself and the connectors are in many cases the worst ever produced. But... plenty of new equipment has no component video options anymore.

So, when buying a HDMI cable check that it has good quality connectors, is multiple screened, has low signal attenuation and most importantly: That it is able to flawlessly handle your equipment's highest video resolution(s) which you intend to use. (This also at the largest cable distance you're ever going to use). It is therefore wise to check or compare HDMI cable performance at home.

In our program we carry The VDH HDMI and the higher quality VDH HDMI HQ HYBRID.

9-8 A suggestion for a turntable vibration-damping platform

An ideal vibration-damping platform for turntables can be made by putting three or four inflatable balls under a heavy tile (e.g. a 5 cm thick marble plate). Mind to keep the balls' valves facing outside so they easily can be reinflated. In case maintaining a steady horizontal position of the floating tile is getting to complicated, you can also use valve springs of an old engine block. 6 to 8 springs will do. Make the whole marble plate including the turntable level by moving the springs around. Always use an accurate spirit level to exactly establish the horizontal.

For more mechano-acoustical damping tips: regarding turntables also see [9-3](#), regarding loudspeakers see [1-12](#), [1-13](#) and [1-16](#), regarding other hi-fi equipment see [3-2](#) and [3-9](#).

3-8 How to avoid switch-on direct currents from damaging your speakers

There are pre-amplifiers that produce a high DC-pulse after switching on. When you already turned your power amplifier (s) on before, your speakers will receive an even bigger and unhealthy DC-pulse.

Advice: Leave your pre-amplifier always on (especially when it concerns a semiconductor design) so no more DC can damage your speakers.

Part 11:

9-15 Improve replay by correctly levelling the platter and tone arm

I have seen many turntables where the platter was not perfectly horizontal. So, when the arm is parallel with the platter also the arm isn't horizontal. If you use a small spirit level (like we have in our program) to adjust the horizontal position of the arm while not having levelled the platter first, there will be a crosstalk unbalance between both output channels of your cartridge.

Advice: First adjust the platter exactly horizontal and afterwards also your arm. This will give less stylus wear on one channel and a much better sound imaging. Don't think that this unbalance will never happen in your system, it also happened in mine.

8-3 Cleaning electrical contacts helps

To clean up the AC mains, it works very well to polish the fuses' contacts at your fuse box. After polishing (e.g. with brass polish) and removing the residue you can put some of our The SOLUTION contact treatment and protection fluid on the contacts. It really works (by reducing AC mains impedance and with it current induced noise). It works even better to also clean the female parts of the fuse holders. **But be careful! First switch off the master switch!** Do not touch live electrical parts - always verify with a mains voltage tester with neon indicator or with a voltmeter - otherwise you may have polished yourself from life to the hereafter. → [Please read our disclaimer](#). With sparkling ideas you always must be very careful in life.

9-17 Checking your pick-up arm bearings can improve replay quality

Pick-up arm bearings need to work without any free space but also without any friction.

A bearing with free space inside (bearing play) gives extra arm colouration (resonance) while friction will kill the suspension of your cartridge.

You can check for bearing play by applying a small up and down force applied in the direction of the arm.

Friction can be detected by giving the floating arm a small push. When the arm stops immediately there is friction. When the arm moves gently inside without abruptly stopping, things are fine. If not, a very good oil can do miracles here: Our TLF Oil type I is such an oil.

8-2 Power your equipment from the cleanest power group

In houses where the fuse box has more than one power group, it's worth the trouble to try and find the cleanest / least noise polluted group (i.e. carrying the least amount of interfering appliances). Use this power group to connect all your equipment to. Or even better: Have a professionally installed separate power group from your fuse box to supply your audio components. This minimizes mains pollution and interference from other appliances.

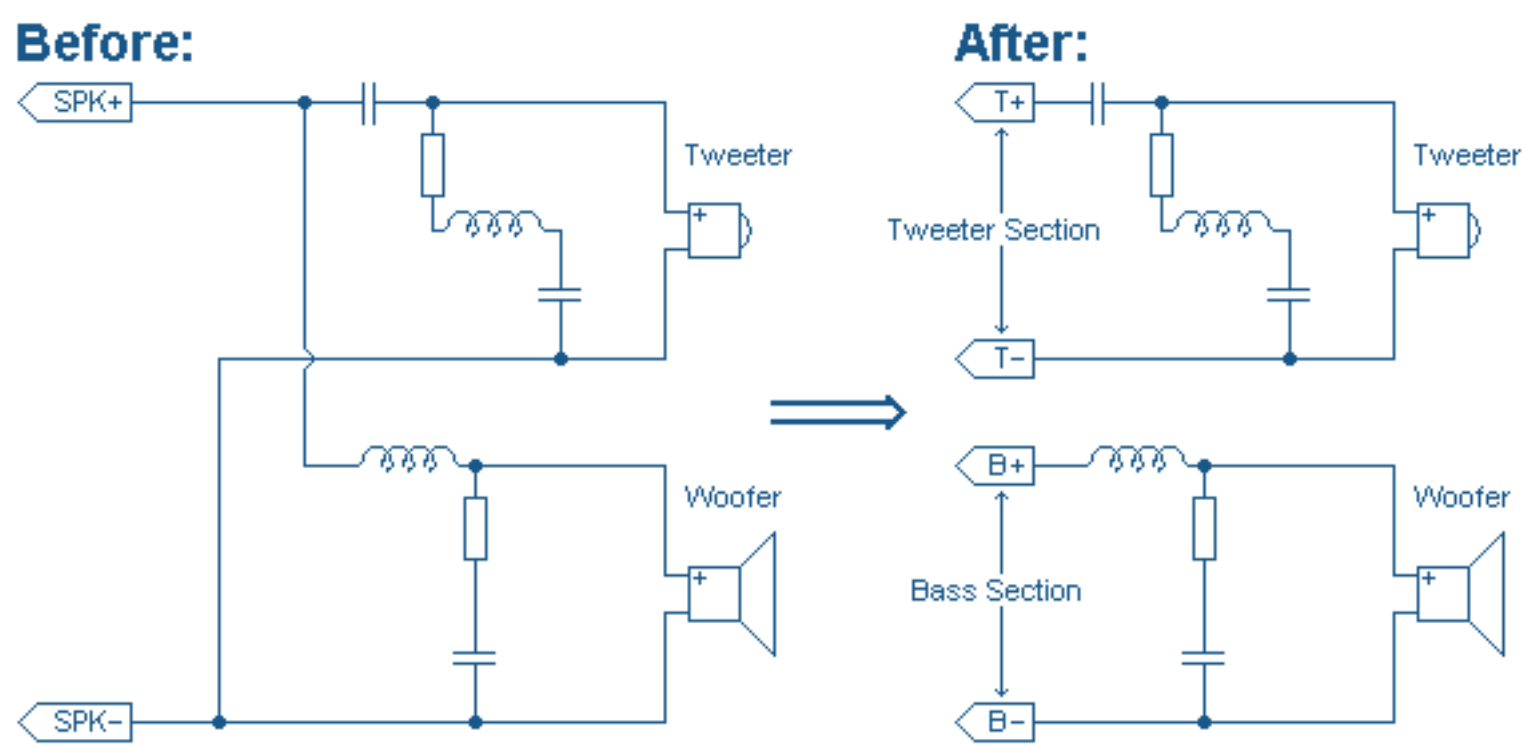
2-17 On the use of port-loaded speakers in smaller rooms

In smaller rooms the use of port-loaded (bass reflex) loudspeakers is not advisable because the basic resonance frequency of such systems mostly matches with one of the resonance frequencies of the room because in smaller rooms those are closer spaced (also see [2-6](#)). Why ask for problems?

The solution here is to fill the port with an old (but fresh) shirt or equivalent (also see [2-14](#)).

1-3 Bi-wiring

In wiring your speakers to the amplifier(s), instead of using a single twin-lead cable for each speaker, bi-wiring is a better alternative. If your speakers are not yet equipped with a double set of binding posts for bi-wiring and want to implement such, then inside each speaker you have to separate the crossover's bass section input from the mid-range/tweeter section's input by cutting links on the printed circuit board and create an extra set of connection terminals at the rear of the speaker. After that, the crossover's bass and mid-range/tweeter section inputs each are wired to their dedicated binding post pair (see figure below). When fully bi-wired, each speaker's woofer and mid-range/tweeter section now have their own twin-lead connection to the corresponding amplifier channel's + and - binding post.



Example figure: Two-way loudspeaker bi-wiring modification

Please note: Your crossover's circuit plan may differ from what's shown here

© Copyright 2004 A.J. van den Hul B.V. All rights reserved.

5-6 Keep digital and analog signal cabling separate

Keep digital signal and analog signal carrying cables completely separate from each other. These signals are not the same breed, don't mingle well and don't understand each other. (It's not even the same language). Furthermore, to avoid high frequency noise radiation from digital signal cabling, using a very well shielded product is the best solution. For this purpose our program carries The DIGI-COUPLER 75 Ohm, a so-called "superscreened" digital audio transmission cable incorporating not less than seven shields. Its emission damping (i.e. its screening attenuation figure, which indicates the ratio between the power radiated from the cable and the signal level it transports) is an impressive 120 dB at 1 GHz and 78 dB at 3 GHz.

6-1 On AC power cables; Clean sound starts at your power source

Being able to draw 30 Amperes from the AC mains without problems does not directly mean that your sound will be good. Thick AC power cables with AWG 10 (5.26 mm²) conductors are impressive in size but may not be in performance. It is much more how clean (i.e. noise free) your AC mains supply is that counts. AC power cords without a screen for instance can act as a serious source of unwanted interference signals, as well as that they are able to pick up interference. A good AC power cable acts as an efficient noise suppression filter, effectively blocking power line noise from reaching - as well as flowing between (through the interconnects' shields) - your equipment. So, wherever possible in your hi-fi system, try to use power cords which are shielded and preferably also contain a power line noise suppression filter. We have such cables in our program: The MAINSTREAM HYBRID, The MAINSTREAM BS HYBRID (specially designed to fit United Kingdom BS {British Standard} type mains plugs) and, specially suited for lower power equipment (up to 500 Watts at 230 Volt mains): The MAINSSERVER HYBRID.

1-17 How to improve the high tone output of cheaper speaker boxes

Cheaper loudspeakers sometimes don't have enough output at the higher frequencies and there's often not enough space to mount an extra tweeter.

The solution: Mount an extra small round shaped cone with a smaller cone angle directly on the voice coil of the bigger speaker in the cabinet: a so-called extra centre cone, just like some older speakers used to have. The centre cone can be made of thicker aluminum foil or drawing paper painted with lacquer on both sides. (Mind that the lacquer doesn't run between the voice coil and magnet).

For related suggestions also see [1-15](#).

9-14 Replacing the old oil helps to keep turntable bearing noise down

A lot of turntable owners are so used to their toy (or tool) that they are not at all aware of constant background noise originating from the bearing and spindle. Older turntables with metal particles in the bearing oil (or what's left over from it) need really an oil replacement. (If the bearing has a steel ball at the bottom also check that, see [9-16](#)).

BP Visco 7000 SAE 0W-40 motor oil is a good start for your fresh oil to keep the bearing in an excellent condition for many years to come. We however have better oil types in our product program, like our special Turntable Spindle Oil and

our TLF Oil type II.

Used oil can be taken out by pushing while rotating a stiff rolled piece of kitchen or toilet paper in the bearing. The paper will absorb the oil for a bit and needs to be replaced several times. When the paper comes out dry and clean, check that no residuals are left, then replace the oil.

Part 12:

1-4 Tri-wiring

When working with a three-way loudspeaker system, tri-wiring is a step better than bi-wiring. With tri-wiring each speaker's woofer, mid-range and also tweeter section (i.e. crossover included) each have their own twin-lead connection to the corresponding amplifier channel's + and – binding post. So, extra to bi-wiring (see [1-3](#)), also isolate the tweeter section in the crossover by cutting links on the printed circuit board, drill another pair of holes and fit them with an extra set of binding posts. Yet another improvement.

5-5 Cable life and PVC insulated/jacketed cables

Especially prevailing in tropical countries but also in general, a high air humidity combined with higher temperatures and air pollution (e.g. as a result of traffic) has a strong negative impact on the durability of PVC insulated/jacketed interconnects and loudspeaker cables.

The commonly used and cheap PVC material contains a plasticizer which slowly disappears in time. With it the insulation will change in properties and get stiffer. From a chemical viewpoint the plasticizer poses a very open window: All kinds of undesired chemicals can penetrate the PVC-jacket and start chemical reactions with the underlying conductors. This works out in color changes of the conductors in the first place. Somewhat later the sonic qualities are changing (the sound gradually becoming harsh).

If a long lifespan is aimed at, look for cables without any PVC in their jacket. Or even better: Avoid all products with halogen containing cable jackets. Our halogen and plasticizer free HULLIFLEX[®] insulation material is a good example. It is used throughout our entire cable program. Also avoid all non protected (e.g. not silver plated) and plain open copper stranded products. They degenerate very fast as a result of a tropical climate's extra high humidity and high temperatures. A tip for a simple way to add extra corrosion protection can be found at point [5-21](#).

8-1 Clean mains power is essential for good music reproduction

When you are experiencing "aggressive" sound during replay your equipment is not always to blame. It can just as well be caused by switching noises, transients and other unwanted interference on the mains. Cleaning the AC power fed to your audio (and video) equipment by means of a good separate powerline noise suppression filter (and perhaps even an additional power (stabilizing) isolation transformer) as well as using power cords which are shielded - and preferably also contain a power line noise suppression filter (see [6-1](#)) - will help a lot. In addition, a special separate ground connection (see [8-9](#)) (i.e. not the regular mains ground provided at your wall outlets) and points [8-3](#) and [8-4](#) will also do a good job.

13-1 Building equipment yourself is instructive

Building equipment yourself is fun and by doing this the work teaches you a lot extra. It helps in understanding your hobby (maybe later becoming your profession) at a higher level.

5-15 On the quality of loudspeaker cable connections

The contact resistance (and its linearity) occurring at your loudspeaker and amplifier's terminals is an often overlooked point. The contact resistance of bad connections can easily exceed the loudspeaker cable's low resistance and hamper your damping factor. (Mind you: there are four contact crossings in each loudspeaker channel's electrical current path). The use of good connectors and being able to firmly clamp them is important.

- We strongly advise against simply connecting the bare (twisted) loudspeaker cable ends directly to your loudspeaker's and amplifier's terminals. Not all the loudspeaker cable's strands will make a good contact this way. They also may fray and cause a short circuit, and they even may corrode; Such connections are prone to introduce distortion.
- If you don't want to use proper connectors, at least make sure that the cable ends are decently twisted and saturated with solder (preferably silver-saturated solder, see [7-5-IV](#)); This guarantees that all strands make a good electrical contact. Furthermore the cable ends are now rigid and thus can be firmly clamped.
- If you prefer screw or nut type connectors, remember that there is still air in between the two contact surfaces. If you want to have absolutely the best connection, solder these metal to metal contacts to seal the joint. Solder well

and use silver-saturated solder (see [7-5-IV](#)).

(Note: You may have to use a heavy soldering iron here. Before soldering temporarily remove any plastic connector parts that can otherwise melt!)

3-3 Monoblock power amplifiers always sound better than a stereo one

Using two monoblock power amplifiers always yields better sound compared to using a single stereo amplifier. The channel separation generally is better, but there's also the advantage that each one can be placed near to a speaker (see [5-14](#)).

4-3 Silencing microphonic tubes

Microphonic tubes (i.e. being sensitive to vibration - which many are) can be kept quiet by mechanically decoupling them from the environment. A simple solution is to use rubber shock-mounting: Rubber or neoprene washers are applied under the screw head and above the chassis, between both sides of the socket's mounting flanges (4 washers per tube). An even better solution is to mount the input stage's sensitive tube(s) on a damped spring floating sub-chassis or on a likewise floating socket mounted on a separate printed circuit board. Furthermore, acoustic pickup and resonance of a tube's glass bulb can be damped by applying a thermal resistant rubber ring (commercially available as "tube ring") or even lead around it.

9-5 MC phono cartridge load impedance

A moving coil phono cartridge with a 40 Ohm DC resistance plays at its best into a load impedance which lies between 200 Ohm ($5 \times 40 \text{ Ohm}$) and 400 Ohm ($10 \times 40 \text{ Ohm}$).

7-1 Keep all your contacts and connectors clean

Keep your male and female cable connectors (like your analog audio, digital audio and video connectors) as well as all other electrical signal contacts of your equipment as clean as possible and apply a good contact protection fluid. If you want to be thorough and just to give you an idea, also have a look at the equipment's ground connections, the RCA/phono panel sockets' nut secured electrical ground/shell contact rings, the clip-on connectors on the crossover network of your loudspeakers (see [1-8](#)), possible other clip-on connectors inside your equipment (see [7-7](#)), your mains plugs and even the fuses in your power lines (read [8-3](#)) and inside your equipment. → [Please read our disclaimer](#).

The electrical contact surfaces of audio equipment especially are at a high threat to become dirty and/or corroded in areas with a high level of air pollution, in rooms in which is being smoked and in tropical countries where the humidity levels are higher and there's more salt on your fingers as a result of more perspiration. Humidity, air pollution and salt act as a chemical accelerator.

Polluted (or even corroded) contacts will cause a more harsh sounding reproduction. For more details about this, please refer to the product information of our recommended The SOLUTION contact treatment and protection fluid.

Further, to keep fresh mating surfaces, unplug and re-plug your connectors and go through all your equipment's switch settings every month.

A practical example of a situation where a large amount of audio contacts can be found is in studios; It takes the technician a week to clean all the contacts in a mixing console. With our The SOLUTION this unpleasant job is finished. The SOLUTION is a completely inert liquid that coats the contact surfaces. Since this fluid allows no chemical actions to take place, it prevents your contacts from oxidizing or getting dirty. Where there is metal-to-metal contact, electrical currents can flow unimpeded. The contact surfaces remain coated and will never oxidize again. Furthermore, by lubricating the contact surfaces, subtraction and insertion wear on the connector's precious metals is reduced. Both properties help to maintain high quality signal transfer for a long period of time.

1-15 Too low output from midrange dome or tweeter / Improving the output from a midrange dome or tweeter

A midrange dome or tweeter which provides too little sound volume can be strongly improved in acoustical output by loading it with a suitable horn. Horn loading however will reduce the driver's off-axis sound dispersion to some extent. Should a horn not be your kind of "instrument", an alternative is to enlarge the magnetic flux in the voice coil gap by appending the driver's rear magnet with an extra one. The stronger the added magnet (e.g. Neodymium), the better. An

extra gain of 1 to 2 dB can be expected.

Crossover filters often also employ an attenuation resistor in series with the midrange and/or tweeter driver. Reducing this resistor will also increase the corresponding driver's output. However, crossover filters are finely tuned and changing any component's value is prone to alter the filter's designed behaviour in more than one aspect. So, only do this when you (or one of your acquaintances) have enough knowledge of crossover filter design.

Part 13:

13-4 Recording microphones; Removing the front grid

When you make recordings, try once to very carefully remove the microphone's front grid (*). In general those grids form an extra resonance chamber in front of the membrane, tuned to create a flat frequency response or (in many cases) to create an extra lift in the frequency response around 20 kHz. The resonance between the grid and the membrane takes away resolution from your recorded sound: there's always a kind of extra ringing.

* Please note: Removing the grid changes the microphone's high frequency response.

Removing the grid must be done with great care. It will expose the delicate diaphragm, making it susceptible to physical damage. Especially with condenser microphones it is very easy to crease the extremely thin diaphragm or even tear it, so NEVER touch the diaphragm with anything.

→ [Please read our disclaimer.](#)

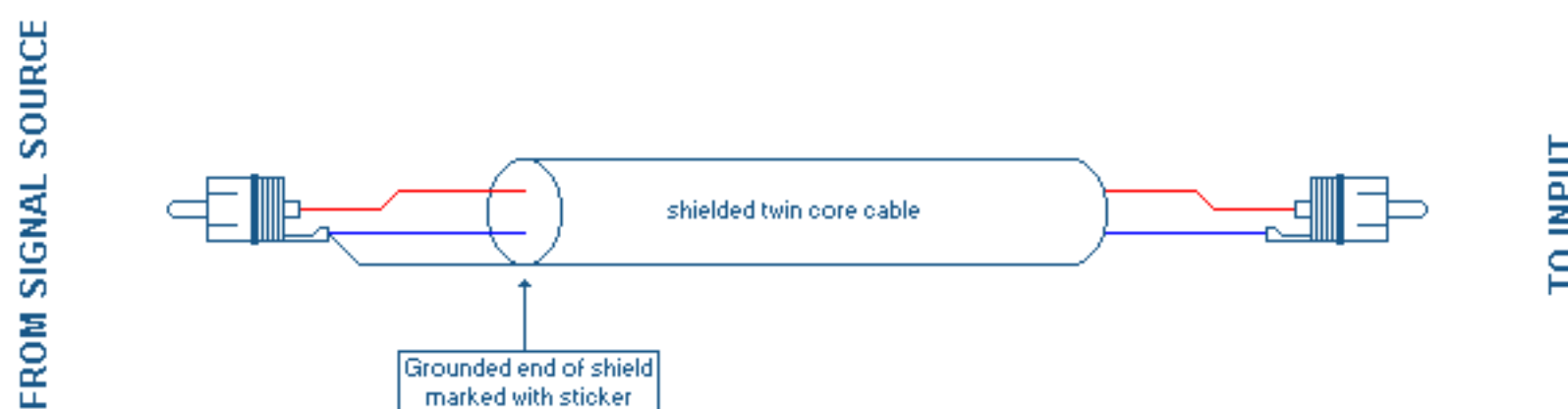
5-9 Cable shield grounding with RCA connector terminated multicore cables

All our screened twin core, quadruple core and triaxial (i.e. balanced) interconnects that are ready-made with RCA type connectors for unbalanced/asymmetric signal transport have their shield connected to the RCA connector's shell (=ground) at **ONE** side of the cable only.

In connecting the shield to ground only at one side of the cable and lifting it at the other side it functions as a true screen: It does not carry any audio signal; It screens the inner conductors and drains away unwanted noise to one location.

The location at which the cable shield is connected to the RCA connector's shell (=ground) generally is chosen to be at the signal source, however in few cases better shielding performance can be obtained by reversing the cable, thus grounding the shield at the signal receiving side.

When reading the "Van den Hul" printing on our ready-made RCA connector terminated multicore cable types from left to right, the grounded side of the shield is at the left hand side connector. Additionally, (as from May '99) we have marked the grounded side of the shield with a special sticker. This side of the cable needs to be connected to the signal source.



© Copyright 2001 A.J. van den Hul B.V. All rights reserved.

If you wish to mount RCA type connectors to one of our multicore interconnects yourself, we advise you to use the same system; I.e. connect the shield to the RCA connector's shell (=ground) only at the "Van" side of the cable's "Van den Hul" printing and leave the shield disconnected at the "Hul" side.

8-6 A suggestion to use battery power instead of AC

Try to replace the power supply of your pre-amplifier by rechargeable power batteries (to start somewhere in your audio chain). This dramatically improves the resolution of your audio signal and the whole reproduction will become more dynamic and open. Once you start to work with power batteries, you will never stop again.

8-9 Make your own clean audio ground

When you are able to do so, make a dedicated ground connection for your hi-fi setup by means of a separate conductor which makes direct electrical contact with the groundwater.

The regular mains ground provided at your wall outlets generally is contaminated with lots of electrical noise and interference. Compared to the regular mains ground, a new made groundwater based earth ground connection is always cleaner.

Please note that (especially salty) groundwater dissolves copper over a certain period of time, so a stainless steel grounding rod is better. The bond wire can be made of copper.

Best is to have your new electrical ground installed or at least checked by a professional. → [Please read our disclaimer.](#)

7-4 Soldering is recommended instead of crimping

Always solder your connections (also see [7-3](#) and [7-5](#) and mind [9-4](#)), even where the plug manufacturer tells you that crimping works very well. Due to the spring action of the crimping, the connection in many cases is not gastight. This leaves an open path along the copper strands for corrosion to set in (due to air humidity and corrosive atmospheric gases). Left open to corrosion, after a while your sound will change and this not for the better.

4-7 Output Transformer-Less (OTL) amplifiers and 4 Ohm loads

Many OTL amplifiers are not able to produce enough power in a 4 Ohm load. The lifespan of the power tubes - like the marvelous 6C33 series - is limited by this reason.

Despite the amplifier being an output transformer-less design, a good solution is to use an intermediate transformer. For this you can use a good quality tube output transformer equipped with a 16 Ohm and a 4 Ohm winding/tap (the 16 Ohm winding connected to the OTL amplifier's output), but my suggestion is to wind yourself one. The primary winding can have an impedance of 16 Ohm and be wound with 1 to 2 mm² metal cross-section area wire. The secondary coil must have wire with a metal cross-section area of 2 to 4 mm². The number of primary turns (N1) can be around 100. The secondary coil then must have 50 turns (N2). By doing this the impedance ratio is $N1^2 : N2^2$ which equals 4 : 1, thus going from 16 to 4 Ohm. The OTL amplifier sees a 16 Ohm load and you save your 6C33s!

1-18 Dull sounding speaker pulse response

When your speakers' pulse response sounds dull you can experiment by moving the tweeters' front panel mounting position forward (*). It makes a world of difference in the timing of the sound. The same frequency response but much more alive.

*: Mind that introducing passage ways for air to and from the cabinet's inside should be avoided, this for instance by using rubber or wooden rings.

Also, with the tweeter probably not being level with the front panel anymore, edge reflections may be introduced which can disturb the tweeter's radiation pattern. To solve this, add material around the tweeter to make a smooth incline (or shape the offset rings accordingly).

9-21 Damping platter resonances

A resonant platter can be damped very well by using the same sticky bitumen as normally applied in cars to silence vibrating panels.

Applying the damping material both underneath the platter as well as in a strip on the inside rim will guarantee the best results.

Make sure that the added mass is equally distributed to keep the platter in balance (to check for balance refer to our Phono FAQ's point 163).

Afterwards verify the balance of the arm board and turntable suspension (see [9-15](#)), because extra material enlarges the weight of the parts concerned.

9-9 Reducing crosstalk by reversing signal polarity in one channel

A sound quality experiment worth trying with playing records is to invert signal phase in one channel along the entire replay/amplification chain and turning back to correct phase at the end. Thanks to all kinds of signal leakage (crosstalk) inside your signal chain's equipment, there are other sounds coming from your loudspeakers than you would expect considering the quality of your phono cartridge. By inverting the input to e.g. the right channel at the start of the chain, a kind of balancing effect is brought about inside all following equipment: Both of the two leaking (cross-talking) signals (from left towards right - in phase, and from right towards left - out of phase) cancel out internally.

The trick only works with phono cartridges where you easily can swap the headshell wire connecting clips: Invert the phono pre-amplifier's right input signal phase by swapping the right channel's red and green headshell wire connecting clips at the phono cartridge. I.e. the cartridge's right channel + output (marked red) now connects to the green clip and the cartridge's right channel - output (marked green) gets the red clip. The left channel stays unchanged. Don't make any changes with the rest of the equipment. The only thing left to do is to revert to correct signal phase in the right channel at the end of the signal chain. This is simply done by swapping the right channel speaker cable's + and - connections, either

at the speaker's or at the power amplifier output's binding posts. Not both!!!

Now you can enjoy your music with crosstalk compensation included and have become a member of the OOPS (the Out Of Phase Society).

Please mind that when switching to other sources you have to change the right channel speaker's polarity back to normal by swapping its plugs.

4-1 Building yourself; A few basic rules

When building your own tube amplifiers, a basic rule is to never let the power and output transformers' bobbins be in the same direction (= parallel) but always perpendicular. Also keep these transformers away from each other as much as you can. Further, twist the heater wires, avoid signal wiring loops (which can pick up magnetic field hum) and use star grounding.

Part 14:

8-7 A suggestion for clean DIY AC mains power

When your AC mains voltage is very dirty (i.e. is contaminated with lots of noise, spikes etc.) and are experiencing interference from it, you might consider to generate your own clean AC mains power by means of a sine generator, an old semiconductor power amplifier (see *1) and a step-up transformer:

1. First of all, in most cases you would just want to provide clean AC power to your music signal sources and pre-amplifier(s). This provides the largest quality gain, since with such devices the audio signals are the weakest and are more vulnerable to mains interference than for instance with power amplifiers. Clean AC powering only the front-end equipment and leaving the power amplifiers on the standard mains furthermore doesn't require a very heavy AC driving amplifier and transformer.
2. As a start you need to determine the total sum of AC power drawn by the equipment that want to provide clean AC power to. The rear side of each device or its manual normally mentions its AC power rating. If the total power rating of your equipment to be fed is (say) 20 Watts, taking a power amplifier which is able to deliver 40 Watts into 4 Ohm and a 40 VA power rated transformer (i.e. both a factor of two larger in power (see *2)) generally will suffice, though more is allowed.
3. The next step is to determine the transformer's required step-up voltage ratio. The total equipment's required 20 Watts is delivered by the power amplifier, which optimally functions when delivering that power into a standard 8 Ohm load. The step-up transformer here provides the required impedance and voltage adaptation, so that, when driving the AC load through the transformer, the amplifier "sees" an average 8 Ohm load. When driving 20 Watts into 8 Ohm, an amplifier delivers a RMS AC voltage of $U = \sqrt{P \times R}$. In this example $U = \sqrt{20 \times 8} = 12.65$ Volt RMS. This is the voltage present at the amplifier side of the transformer. At the equipment side the transformer's voltage needs to be equal to your country's AC mains voltage. In this example we choose the European 230 Volt mains, so that the transformer's required step-up voltage ratio (= turns ratio) is 12.65 : 230. This can be achieved by using a plain 230 to 12 Volt mains transformer hooked up in reverse (i.e. with its 12 Volt secondary winding connected to the amplifier's output terminals).
The step-up transformer is preferably a standard E-I (shell/stacked) core type. Toroidal core transformers have many advantages, but their higher inrush current and higher primary inductance may put too much stress on the driving power amplifier and possibly damage it when switching the load on and off.
To summarize; In our example the required step-up transformer would be a 40 VA power rated, 230 to 12 Volt mains transformer with a standard E-I core.
4. When all needed parts have been gathered. Hook up the sine generator to the amplifier's input, the transformer with its 12 Volt winding to the amplifier's output and (for testing purpose, according to our example's 20 Watt total power drain) a 20 (or 25) Watt light bulb to the transformer's 230 Volt winding. Now first set the sine generator's output level to zero and adjust the generator's frequency to 50 Hz (or 60 Hz, dependent on the AC mains frequency prevalent in the country you live in). Then switch on the amplifier and sine generator, measure the AC voltage present across the test light bulb with an AC voltmeter and slowly increase the sine generator's output level to obtain a reading equal to your country's AC mains voltage.
When all has been correctly set and verified remove the test light bulb. The audio equipment to be fed clean AC power now can be hooked up and switched on. But make sure that your sine wave generator's correctly set output level (to obtain your country's AC mains voltage) and frequency cannot be changed by accident, else the audio equipment can be fed a too high or too low AC voltage and become damaged. It is therefore advisable to permanently connect an AC voltmeter (e.g. a simple, cheap multimeter) to the outlet feeding your equipment and to verify that the AC voltage is correct before switching on your audio devices.
5. When you take a stereo power amplifier you can even use one channel and transformer to power all analog equipment and the other channel and another transformer to separately feed all digital equipment.

*1 Remark: Use an old or left over semiconductor power amplifier which you can afford to experiment with, because some less stable amplifiers cannot handle to drive (unloaded) power transformers and can even become damaged.

*2 Remark: Although the example's power amplifier is operated driving 20 Watts average into an 8 Ohm load, to handle the peak currents drawn by the connected equipment's internal DC power supplies (with their rectifier diodes and DC smoothing capacitors) and to maintain mains voltage stability under load variations, both the step-up transformer and the amplifier's power rating (latter as specified into a 4 Ohm load) should be at least two times larger than the total maximum power consumption of the equipment you want to feed.

→ [Please read our disclaimer.](#)

9-10 Realising a balanced phono pre-amplifier out of two unbalanced ones

When you have a pre-amplifier with balanced in and outputs as well as a power amplifier with the same balanced configuration, but your phono stage/pre-amplifier isn't balanced, it is very much worth to also have this part of your chain balanced since it most likely will improve your sound quality: Amongst the numerous sonic advantages of balanced configured equipment and wiring, the most important one is its high immunity to external noise/interference, i.e. a better hum (and noise) rejection.

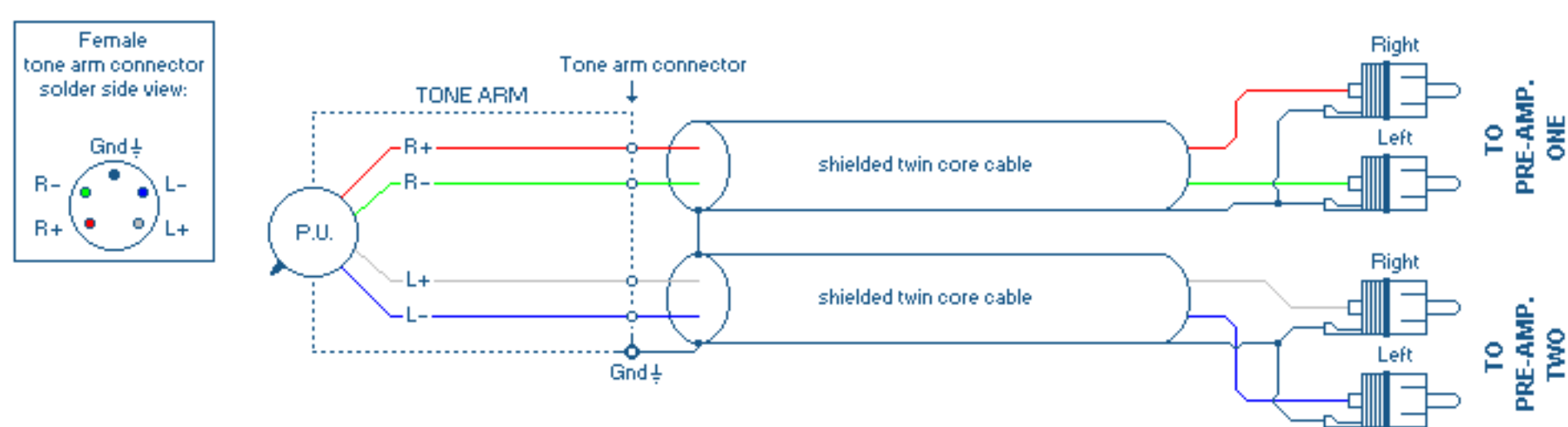
You can of course buy a good balanced phono pre-amplifier, but if you're able to get a second single-ended input phono stage (identical to the one you already have) you can also realise a balanced phono pre-amplifier out of two single-ended ones. Here's how:

First start by connecting your phono cartridge in balanced mode to both phono pre-amplifiers' inputs (where phono pre-amplifier one serves to amplify the right channel and phono pre-amplifier two amplifies the left channel):

Have two balanced cables (e.g. a pair of our D - 501 HYBRID, D - 501 SILVER HYBRID or a single length of our twin version D - 502 HYBRID) to go from record player to both your phono pre-amplifiers.

At the record player side these two balanced cables are wired to the tone arm connector found in the socket of the tone arm, see figure below. (By the way, standard female 5 pin 270 degree angle configuration tone arm connectors are also available from our program as The TAC).

At the phono pre-amplifier side each balanced cable is terminated into two RCA type connectors (i.e. four in total), see figure below:



© Copyright 2005 A.J. van den Hul B.V. All rights reserved.

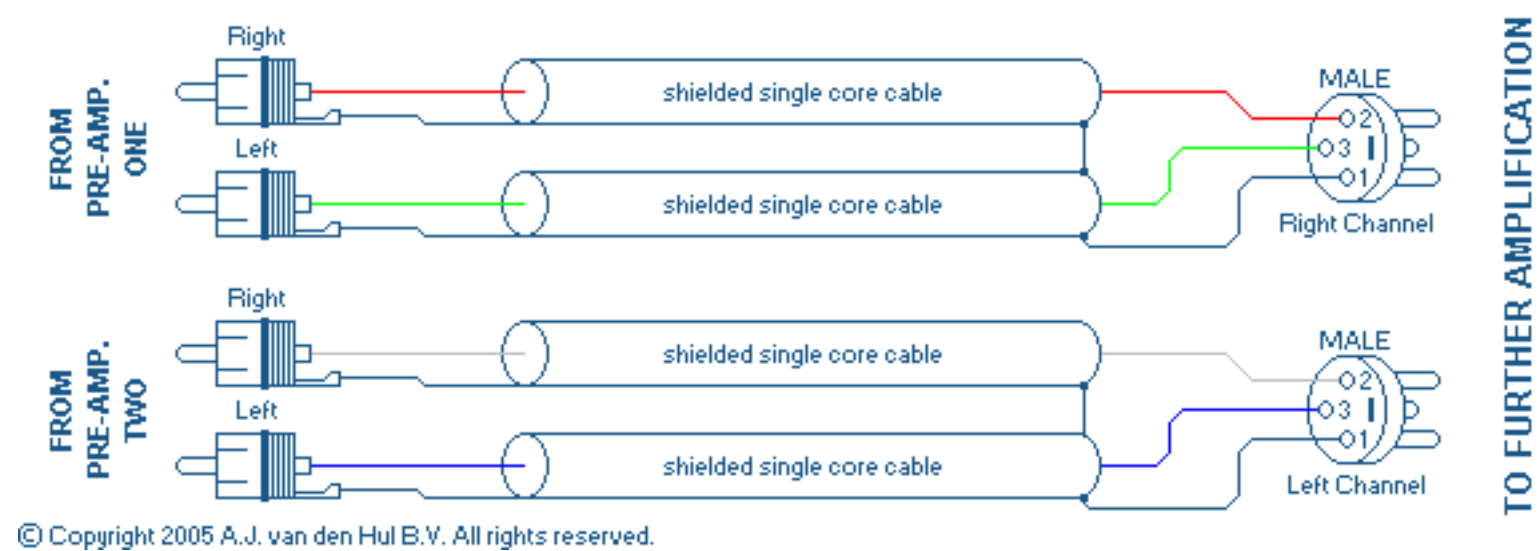
In essence all four phono cartridge's lead-out wires (R+, R-, L+ and L-) are balanced mode connected to the phono pre-amplifiers' inputs:

- Right channel plus (R+ = color coded red) connects to phono pre-amplifier one's right input (RCA connector center pin).
- Right channel minus (R- = green) connects to phono pre-amplifier one's left input (RCA center pin).
- Left channel plus (L+ = white) connects to phono pre-amplifier two's right input (RCA center pin) and
- Left channel minus (L- = blue) connects to phono pre-amplifier two's left input (RCA center pin).
- The right channel balanced cable's shield connects from the ground of the tone arm (this is the middle pin of the 5 pin 270 degree angle DIN tone arm connector) to both pre-amplifier one's RCA connector shells and
- The left channel balanced cable's shield connects from the ground of the tone arm to both pre-amplifier two's RCA connector shells.

For the balanced cables' splits, which go to each RCA connector, short pieces of shielded single core cable can be used.

The phono pre-amplifier outputs:

Connecting to your further amplification, your four phono stage/pre-amplifier's unbalanced RCA type outputs need to be combined into two male balanced XLR connectors (one XLR for the right channel coming from pre-amplifier one and another XLR for the left channel coming from pre-amplifier two). This means making two special RCA to XLR adapter cables, see figure below:



With each RCA to XLR adapter cable:

- Right channel output (RCA center pin) connects to XLR connector pin 2.
- Left channel output (RCA center pin) connects to XLR connector pin 3 and
- Both RCA connector shells connect to XLR connector pin 1.

Further remarks:

- Please mind to always keep both phono stage/pre-amplifier's gain settings equal, else your channel balance will be off.
- A technical refinement for tuning specialists: If your phono stage inputs have selectable cartridge load settings, you also need to change these: If your single-ended connected pre-amplifier's optimal sounding input load settings were (say) 47 kOhms and 100 pF, with the new balanced mode wired configuration you now have to go to 22 kOhms and 220 pF (set equally at all four inputs). I.e. the load resistance needs to be halved and the load capacitance needs to be doubled (choose the closest available settings) to maintain the same effective cartridge load as before.

Hooking up your two single-ended input phono stages in this balanced manner is some work, but the sonic result will be such that afterwards you most likely will always leave your turntable connected in this way.

7-6 Electrical connections in older audio equipment (1)

Older amplifiers sometimes get problems with their solder connections, especially at spots where the temperature gets higher (the solder joints can for instance become corroded or get metal fatigue due to thermal stresses). Resoldering (preferably after removing the old solder with e.g. solder sucking wick) takes some time but the sonic result is clearly better. For this purpose we have introduced a special lead-free silver solder, also see [7-8](#). The result is a higher electrical stability and a better sound. The removal of the old- and the application of new solder afterwards must be done carefully to avoid spilling tiny drops and/or making short circuits and try to keep the soldering time as short as possible (also see [7-5](#)). If you are inexperienced in soldering, best is to have this rework done by a repair man. → [Please read our disclaimer](#).

7-7 Electrical connections in older audio equipment (2)

Some older audio devices did have printed circuit boards terminated with mounting pins and/or clip-on connectors. Over time these often become corroded/oxidised. The wrapped wires or the clips don't make an intimate electrical contact with the pins anymore. So, after cleaning the connections, also solder them and have a better sound (also see [7-8](#)).

9-18 A suggestion for improvement of the phono pre-amp's cartridge loading resistors

Some phono pre-amplifiers use plugs with a metal oxide resistor to create the correct load impedance for the phono cartridge. Mostly these metal oxide resistors contribute to extra harshness in the sound. A replacement with higher quality resistors (*) improves the spatial reproduction and reduces system harshness.

*: In order of increasing quality:

- 1) Carbon film resistors with 5% tolerance (price: low).
- 2) Precision wirewound (non-inductive!) and precision metal film types with 0.5% or tighter tolerance (price: more expensive).
- 3) High precision metal foil resistors (e.g. Vishay VSR series) (price: quite expensive).

8-8 Even transmitters need a clean mains

When you work with transmitters, keep in mind that your RF signal also pollutes your own mains. And to have a clean audio modulation signal you for sure need a clean mains. Here, using well shielded AC power cables which also contain a power line noise suppression filter (like e.g. our Mainsstream products, see [6-1](#)) isn't a superfluous luxury.

4-5 Output transformer distortion due to bias current imbalance

With tube amplifier push-pull output stages where the power tubes have reached a significant imbalance in their bias (= anode) currents, or with single-ended output stages where the power tube has drifted towards a too high bias current, the output transformer's core can reach early magnetic saturation at signal peaks or may even remain in saturation without any signal applied. In any case excessive distortion will be audible.

Best is to check (or have checked) whether the power tubes have reached the end of their life and, if so, to replace them. If they are still good or have been replaced by new ones, re-adjust the tubes' bias currents.

If latter is impossible, an old trick is to put a magnet on top of the transformer to balance out/desaturate its core's magnetic field. The exact position, orientation and strength of the magnet requires experimenting and careful listening. The magnet can remove the transformer core saturation's caused distortion and with it also helps to extend the remaining lifespan of drifted tubes.

5-17 Unbalanced multicable for recording, a suggestion

In many hobby recording situations the microphone inputs are unbalanced. Where multiple microphones are used, applying our RGB-5-75 fivefold coax cable as an unbalanced multicable provides an affordable solution.

3-4 A suggestion for taking amplifier feedback from the speakers

Practically all power amplifiers get their feedback from the output signal. The point where each amplifier channel takes its feedback signal generally is located on the printed circuit board close to the wires connected to the speaker binding posts. Provided that the amplifier does not have any circuit elements in series with its output (see the "[please note](#)" [points below](#)) better feedback can be taken from the loudspeaker terminals: By doing this, any signal losses arising along the loudspeaker cable and across its contact points at the amplifier and speaker binding posts now are also taken into account. In addition the amplifier can better counter the return signal generated by the dynamic speakers' voluntary movements (i.e. the back-EMF, also called: counter Electro Motive Force) and thus yield a better damping factor. The amount of effect of moving the feedback sense points towards the speaker terminals differs though between amplifiers having a bridged output stage and single output stage ones:

With bridged (i.e. balanced) output stage amplifiers the signal losses and the back-EMF current's voltage drop occurring along both the speaker cables wires can be accounted for. With single output stage amplifiers on the other hand only the speaker cables positive/hot lead's voltage drop can be compensated for, which still results in effectively having a speaker cable twice as thick (i.e. effectively doubling its cross section area).

As said before, the trick is to move the points where the amplifier takes its feedback signal from (i.e. its sense input) from the printed circuit board towards the speaker terminals. There is the best signal available you need for high quality feedback. The feedback line from the speaker towards the amplifier needs to be well shielded. Best is to use a quality audio interconnect cable here.

Schematic illustrations of the wiring for both bridged output stages and single output stages are shown in the figure below:

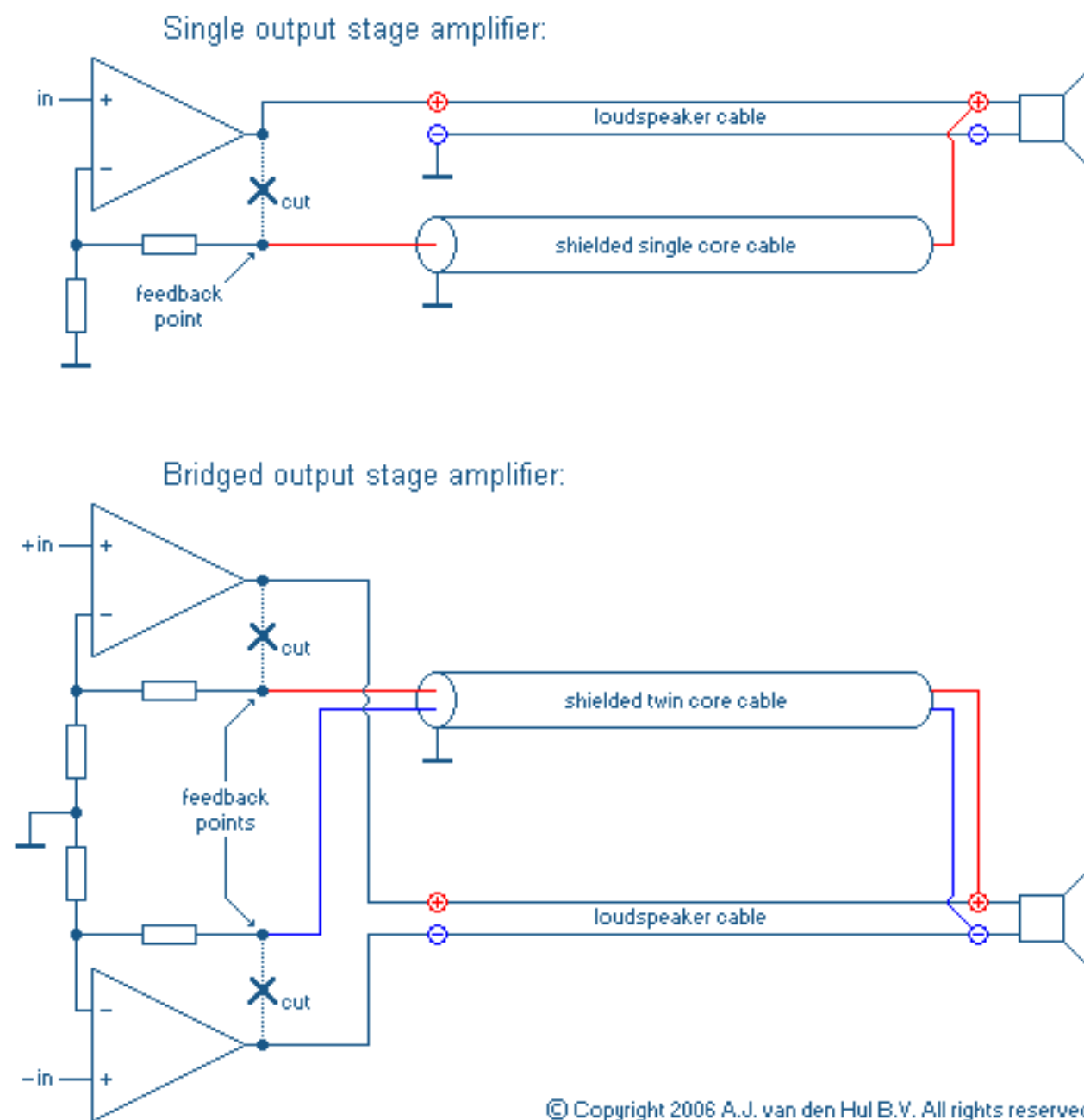
Please note: This tip is for the more experienced electronic engineer. When in doubt always ask the help and advise of a professional!

Moving the amplifier's feedback sense point(s) towards the speaker terminals is only possible when the amplifier is not equipped with any inductor (part of a Boucherot network) and/or any relay contact (for speaker protection) in series with its output! Moving the feedback sense point behind such circuit elements will cause amplifier stability problems and is very likely to cause damage to both your amplifier and speakers!

It is furthermore very important that the amplifier's feedback taken from the speaker always remains connected and such in correct polarity when the amplifier is switched on, else damage to your speakers (and amplifier) is very likely to occur!

→ [Please read our disclaimer.](#)

Taking amplifier feedback from the speakers schematic illustrations



7-5 Some soldering tips (for instance when mounting connectors to (our) cables yourself)

- I. To prevent mechanical damage to the conductors (like scraping off the silver cladding), whenever possible strip your cables with a thermal stripper, for example your soldering device.
- II. The optimal soldering temperature is around 275 degrees Centigrade (around 527 degrees Fahrenheit). A lower temperature will make a cold (brittle) joint, while higher temperatures will give you oxidized solder. Soldering should be a matter of seconds, not minutes.
- III. After you have made the soldered joint, wait 5 seconds longer than normal and don't move anything. This will make sure that your joints are made well and will last longer.
- IV. When available, use silver-saturated solder (commercially available Tin/Lead/Silver (Sn/Pb/Ag) types with a 2 to 5.8% silver content or our lead-free silver solder). Or, if you can afford it, replace the tip of your soldering device with a silver tip; This way it is guaranteed that your solder is always 100% silver saturated. However, if you use one of our Van den Hul cable or wire types, you don't necessarily need silver solder since part of the extra silver layer at the outside of all strands will partly dissolve in the liquid solder and directly creates a good silver content in the joint.
- V. Solder at the right temperature and don't apply heat too long else the cable conductors' insulation will melt. This increases the risk of a short circuit occurring anytime during the cable's life.

Please note:

Our HYBRID type interconnects use Linear Structured Carbon[®] inside the cable which, when incorrectly assembled, can cause an (intermittent) low ohmic short circuit inside the connectors. This can give rise to all sorts of noise, loss of sound, distortion or coloration. When mounting connectors to our HYBRID type interconnects therefore make sure that:

- a. The black Linear Structured Carbon[®] layer covering all internal conductors is locally removed so that it can not cause any low ohmic short circuit.
- b. The cable shield contains black conductive helically wound tape, which when not removed at the ends may also cause a low ohmic short circuit inside the connectors.

When having mounted a connector always verify with an ohm meter that the resistance between any contact combination on the connector measures "infinite" (open circuit). Slightly twist/bend the cable near the connectors when performing this tests to also verify that no movement can induce a short circuit.

- VI. Close the cable ends as much as you can to avoid air penetration. In the industrial world all air is polluted with corrosive gases. Due to each day's temperature variations the contaminated air tends to flow in and out of your cables where in the long term it can cause corrosion and do harm to your audio quality. To arrest corrosion we use

the best jacket and insulation materials available, and the silver coating on our cable's strands further makes an excellent protective shield. Nevertheless, ensuring that the cable's jacket/insulation is also airtight at its ends is a good extra measure to ensure maximum lifespan and constant audio quality.

Soldering with a thermally activated flux already blocks the entrance of air: It cleans all strands, and both the partial melting of the insulation and the absorption of the solder's flux will seal the conductors' ends.

If you want to add even more protection, before soldering you can also inject some of our The SOLUTION protection fluid with a syringe between the strands at both sides of the cable. This coats the conductors' strands and seals the internal world of the cable off from the exterior world. This trick is also very effective with multi-stranded loudspeaker cables. Hang them vertically and at the top side inject them with The SOLUTION fluid. Let them hang for at least 24 hours before soldering.

Part 15:

5-16 Making your own video cables; What to beware of

When you make your own three-wire component video or five-wire RGBHV video cables, keep the individual lines precisely equal in length. Also avoid any positioning of the cable which causes pressure on its insulation; Indentation affects the cable's impedance at that spot and causes changes in signal timing. A less focused picture will be the result. Also essential with these very critical high frequency connections is to keep the contacts clean. Furthermore, always use 75 Ohm impedance rated connectors.

1-14 Measurement and control of panel resonances

Loudspeaker cabinets are always subject to mechanical vibrations. You can feel this by e.g. putting your fingers against the side panels. You can also hear these resonance modes by simply putting an ear against the panels or (better) by exploring various locations with the blade of a screwdriver while holding its rounded end against your ear. A mechanic's stethoscope (i.e. with a probe tip on top) will tell you even more. You can also hear, view (on an oscilloscope) or measure these effects without any microphone: With removable adhesive tape just fix a small magnet to the panel you want to investigate. (A thin layer of soft sticky compound will also do well). Take an old Moving Magnet (MM) phono cartridge (*1) and remove the replacement stylus. Put the cartridge on a stand and position it as close as you can to the magnet (not touching it). The vibrating magnet will modulate the strength of the magnetic field as sensed at your MM phono cartridge. When you connect the cartridge to a MM phono pre-amplifier (*2), you can simply hear all panel resonances. An oscilloscope connected to the amplifier's (tape) output will even show more.

Experimenting with internal reinforcements and damping materials (also see [1-13](#)) will teach you how to kill the panel resonances...

*1 Remark: Instead of a MM phono cartridge a telephone pickup coil or guitar pickup can also be used.

*2 Remark: A phono pre-amplifier is suitable for simple listening evaluation, but its internal RIAA equalisation filter will color the sound. If measurements are intended to be made, a simple alternative is to use the microphone input of e.g. a cassette recorder. This will measure flat in the audio band.

4-10 Cryogenic treatment of tubes and cables

Amazingly, tubes from tube amplifiers improve in sound quality after they have been deep-frozen to around -200 degrees Centigrade (around -328 °F). Keep in mind that to avoid damaging the tubes, the temperature changes must be very very slow. To give an idea of the temperature profile: 8 hours from room temperature till -200 degrees, then holding for at least 8 hours at this deep temperature and then another 8 hours for getting back to room temperature.

I have listened to two identical amplifiers with just one difference: This temperature treatment. Really worth the experiment.

Freezing cables was an experiment made at the same time. The final result was much less and disappeared again after a while. (Also see our Cable FAQ's point 3-10).

3-7 Better wiring inside power amplifiers

Many power amplifiers have very impressive output binding posts. But... as soon you look inside, the connecting wires coming from the output stage often are quite flimsy. So most of the effort made to get a good quality by using heavy loudspeaker cables is lost along the thin internal wiring. Yes, you've already guessed right: Replace all thin output (and power) wiring by material you trust. Keep in mind that the related copper traces on printed circuit boards often also are very thin. They can be upgraded by soldering higher quality conductors on top of them. → [Please read our disclaimer](#). This wire work may keep you busy a whole Saturday but it's worth the effort. In bygone days, everyone knew that hardwired amplifiers always sounded better.

4-8 Lower bias setting increases power tube lifespan

Many tube amplifiers (class AB or even A) have a too high bias setting. This reduces the lifespan of the power tubes and creates too much heat. A 5% lower setting of the bias current will help both (*). Regarding the sound there will hardly be

any difference.

*: First check the manufacturer's recommended bias setting and then try going 5% lower. If your bias current can not be adjusted or are not sure how to do this, please seek the help of a more experienced person. In the first case the cathode or grid bias resistors can be changed. → [Please read our disclaimer](#).

7-3 Where possible solder all connections

Always keep all electrical contacts clean (see [7-1](#)). However, to ensure the best possible sound quality and avoid corrosion problems, when possible solder all connections (except at your phono cartridge, see [9-4](#)) instead of crimping (see [7-4](#)), clamping or even just having a bare frayed speaker wire end under a binding post (see [5-15](#)). (For some soldering tips, see [7-5](#)). If soldering is not worth considering or impossible, we advise to apply our contact treatment and protection fluid named "The SOLUTION" on all audio contact surfaces.

7-8 Sound improvement by using lead-free silver solder

Lead-free silver solder (available from our program) sounds better than plain electronic solder. Resoldering all your connecting cables (after removing the old solder with e.g. solder sucking wick) is another way of improvement. Slight disadvantages of lead-free silver solder are that it is more brittle than standard Sn60/Pb40 (60% Tin / 40% Lead) electronic solder and that it needs another 50 to 75 degrees Celsius (90 to 135 °F) extra due to its higher melting temperature, so soldering with it requires some more experience.

3-5 Better sound by adding film capacitors

Many older amplifiers (but also many new ones) noticeably improve in sound quality when high quality film capacitors are connected in parallel to the many electrolytic capacitors. This job needs a bit of experience but is not too difficult. → [Please read our disclaimer](#).

4-6 A tip to measure transformers with interrupted windings

In order to find a replacement, measuring the specifications of a (burned-out) transformer with an interruption in one of its windings is often still possible. The wire break can be attempted to be bridged by using a high voltage spark (*). The spark evaporates some copper and with it can create a tiny connection, just enough for performing low current measurements. Though sometimes even squawkers and tweeters with a break in the voice coil lead-in wire can be fixed in this manner.

* Remark: The spark can be induced with a charged high voltage capacitor. (Potentially lethal; use extreme caution!). → [Please read our disclaimer](#).

Experiment by starting with small! capacitor values (e.g. 1 nF). If this doesn't work, slowly work your way up to 10 nF etc. Mind that (with the dielectric strength of air approximately being 3 kV/mm) the required voltage to spark say a 0.1 mm (0.004") air gap would roughly be about 300 V.

1-10 Crossover filter components

Another step forward is replacing all electrolytic capacitors in the crossover filter by film types, like metal foil polypropylene ones. (If those are too expensive, you can start experimenting by first applying more affordable metallised polyester film (MKT) types and if desired work your way up to the more audiophile polycarbonate, polypropylene or even Teflon or paper in oil types. For crossover applications, as a rule, capacitors with metal foil electrodes are preferable over metallised ones).

Furthermore, avoid all inductors with ferrite or iron cores. Replacing ferrite, iron or any thin wired air core coils by air chokes made of a thicker copper wire or even copper foil yields further improvements.

Part 16:

3-10 Shorting unused inputs

Pre-amplifiers, receivers etc. often have many selectable audio inputs of which not all are used.

The unused inputs are left open and along this way it is sometimes possible for electrical noise and radio frequency interference to leak into your audio signal.

This is dependent on the quality of the internal circuitry and construction of the audio device in question.

Electrically shorting the unused inputs is a good idea to make sure that this crosstalk path is effectively blocked.

So, go to your audio dealer and buy some cheap RCA type male connectors. With each connector solder a very short wire between the center pin and shell so that the plugs are electrically shorted. Then insert them in your unused inputs.

You may well find that your noise floor is lowered and that the audio has become cleaner.

2-21 Sound coloration; Shorting unused speakers

Dynamic loudspeaker boxes act like resonators and can colour your room-sound when they don't "see" a low resistance at their input terminals. This happens when they are connected to an amplifier which is switched off -or- when they are not connected at all.

So, if you have dynamic loudspeaker boxes in your listening room which aren't in use (at the moment). It is a good idea to first disconnect them from the speaker cables (!) and then screw or insert a copper wire bridge between their terminals so that they are in effect electrically shorted.

When you want to use those speakers again, don't forget to remove the copper wire bridge before reconnecting them to the amplifier, because amplifiers don't like short circuits!

The same resonances are also prone to occur in audio dealer listening rooms which present a large number of speakers to switch between and compare. Switching between the speakers is often done by a pushbutton selection panel which controls simple single-contact relay switches. When listening to one speaker pair, all other ones are left disconnected (i.e. open circuit) and thus act as resonators which colour the room sound. The better control panels avoid this by also shorting the unused speakers (without shorting the amplifier of course). This requires more relay contacts and a short delay timer, which makes such control panels more expensive. But if you're good in control logic you can easily figure out how to make this yourself.

13-7 Keep your listening room a non smoking area

Apart from the fact that smoking is very bad for your health, it's also quite harmful to your audio equipment, CDs etc. Smoke enters everywhere and over a period of time will buildup a thin tar-residue layer. This tar is chemically extremely aggressive and corroding.

Mechanical switch contacts in your equipment are especially sensitive to this. I've seen pre-amplifiers equipped with high quality gold plated relay contacts where the tar even completely had eaten its way through the gold layer, with all negative sonic results thereof.

Applying some contact treatment and protection fluid like our The SOLUTION may help prevent this, but it's always better to avoid fire than to extinguish it.

Smoke doesn't only get in your eyes, it will eventually also reach your ears, one way or the other...

10-11 Listening with your eyes closed

Listening with your eyes closed allows you to far much better concentrate on the music and analyze all details of the soundstage and recording. It also makes doing A-B comparisons a lot easier.

With your eyes closed however, some distracting light still comes through your eyelids. Putting a hand in front of your eyes or, even better, using sleeping eyeshades (like those left over from the amenities kit from your last air trip) gives better results.

Devoid of any visual stimuli you'll find that you can dig much deeper into the soundscape.

Try it and you will be amazed how much better you can "see" with your ears.

5-24 DIY Loudspeaker cables made from loosely twisted single leads

Next to twin lead and quadruple lead speaker cables, in our program we have a broad range of high quality single lead wire types that are normally used for internal loudspeaker wiring. Improving your speakers or your power amplifier's internal wiring with those is an idea in itself (see [1-7](#), [1-8](#) and [1-9](#)).

However, they are also excellently suited to go from your amplifier(s) to your speakers. Just solder on some good plugs (like our bus connectors) and loosely twist each wire pair.

Exceptional results are possible with our Super-Copper-Silver multistrand type SCS - 12 (3.89 mm² / AWG 11.3). And if you want to go even thicker, there are our SCS - 6 (13.5 mm² / ~AWG 6), SCS - 4 (21.6 mm² / ~AWG 4) and SCS - 2 (33.9 mm² / AWG 2) types.

If you want to go pure silver, try our MCS - 1000 1mm solid core insulated Matched Crystal Silver wire (0.785 mm² / ~AWG 18) and use as many wires in parallel as you want.

If you're more on a budget, also our CS - 12 HF (2.96 mm² / AWG 12.5) and CS - 14 HYBRID or CS - 14 (both 1.97 mm² / ~AWG 14) come highly recommended.

5-25 DIY Interconnects made from multiple twisted single leads

If you're experimenting with making high quality interconnect cables yourself, here are a few suggestions from our program that were found to give matchless performance in our listening tests:

Our Matched Crystal Silver wire types: MCS - 1000, MCS - 300, MCS - 150 M. (Also our lower priced SCS - 18, D - 101 and SCS - 28 M perform very well).

As an example, twisting 4 lengths of The MCS - 150 M together (with clockwise conductor wiring + - + -, i.e. in a starquad configuration) will make one of the finest interconnects you can think of; extremely smooth with a lot of very fine detail. Also as internal signal wiring in pre and power amplifiers our above mentioned wire types are a very good choice.

Please note: You normally also need to add shielding. Only if you work with balanced signals in situations where there's little external noise and interference (very rare) the shield might be left out.

13-8 A superb ignition cable...

Here's a tip that doesn't directly have to do with your audio at home, though, when it comes to DIY suggestions for improving things with our cables, is more than worth to mention:

In our program we have a very special ignition cable, named the HQ - 1. Quite different from common ignition (resistance) wire types, it was designed to deliver every drop of ignition energy to your spark plugs without any losses. Replace your car's standard ignition wire by this one and your engine runs more economic, with more power and also much more clean and stable.

Just how much a little wire replacement can do...

(Also see our Cable FAQ's point 4-13).

5-26 Headphone cable and wiring; Marked improvements possible by DIY replacement

Listening music through good quality headphones can be a delight. Good headphones provide a way to listen to music more analytically and at a much better price to quality ratio than with speakers of the same price range.

Without being bothered by the listening room's acoustics (and with your eyes closed, see [10-11](#)) you can also concentrate more on the music and recording itself.

Headphones are supplied with the manufacturer's cable, which is often stated to be highest grade 99.9% or even purer oxygen free copper. This doesn't stay that way however: If not well protected, the copper degrades by chemical activity, and, if the strands aren't thin enough, the frequent bending also gradually damages and breaks down the conductors.

Your sound will slowly become harsh.

I've also seen headphones which cables used steel strand wire conductors. They are almost unbreakable, but this at the expense of sound quality...

Here are some suggestions for DIY replacement or improvement of your headphones' (old) wiring. The results can be very rewarding:

- Inside the headphones our MCS - 150 M multistrand insulated Matched Crystal Silver wire is the best possible replacement.
(But also as external headphone cable 4 strands of MCS - 150 M work extremely well. For extra protection you can add a extra strain relief wire and run the wiring through a thin flexible tube (e.g. silicone rubber)).
- Extremely special as external headphone cable is our CC - 18 metal free single lead insulated Linear Structured

Carbon[®] wire. The sound is utmost clean, pure, open and natural. Use 4 wires braided together. The CC - 18 is very flexible with a rubber-like insulation. The wire itself is also unbreakable, provided you add sufficient strain relief at the terminations since they're crimp type. (I.e. adding an extra strain relief wire can't hurt). The CC - 18 is about 38 Ohm per meter, so a 2 meter signal feed and return wire will add a series resistance of 152 Ohms for each capsule. But this is no problem with headphones since their drivers are acoustic resistance controlled (i.e. their impedance only varies little with frequency) and contrary to standard dynamic loudspeakers (which are mass controlled) don't need to be driven from a low amplifier source impedance to maintain a flat frequency response.

For headphones, the international standard on audio interfaces IEC 61938 calls for a source impedance of 120 Ohms. As such many headphone outputs are equipped with 120 Ohm series resistors. If you use our CC - 18 those resistors can be left out because they are already embedded within the cable. If not left out, the sound volume of your headphones will only be somewhat lower so you need to turn up the volume control a little bit more.

- Our D - 501 HYBRID, D - 501 SILVER HYBRID and D - 502 HYBRID also are well suited for use as external headphone cable. They are thin, flexible and shielded. The D - 501 SILVER HYBRID has highest grade Matched Crystal Silver conductors. The D - 502 is a twin version of the D - 501 with a useful added steel strain relief wire.
- When stripped of its jacket and shield, our The INTEGRATION HYBRID's four inside FUSION conductor material conductors are very good as external headphone cable. The conductors are strong and flexible and are much less susceptible to breakage due to frequent bending than the standard found copper.

8-10 Getting your AC power even more quiet

Having taken lots of measures to provide your audio equipment with clean AC power from your mains, like a separate power group (see [8-2](#)) and dedicated ground (see [8-9](#)), mains filters (see [8-1](#)) and special AC power cables (see [6-1](#)) there can still be some sources of interference left. After all the rest of your house's or building's AC power system may still feed some noise generating household appliances and other devices.

Of course it's an idea to listen at night when the world is more quiet, but we all need some sleep.

Here's an idea that I came up with when making recordings in a building that had lots of electrical noise and where my own clean mains supply couldn't get rid of all. If you want to clean up your mains even further, this idea also works at home:

Buy some mains plugs and spark quenching capacitors of sufficient voltage rating. The latter consist of a resistor capacitor series network, (e.g. Vishay Roederstein type F1776: 0.47 microFarad + 47 Ohm).

Mount the spark quenching capacitors inside the mains plugs and insert those at various mains outlets spread throughout the house, preferably next to noise generating devices (*). → [Please read our disclaimer](#).

What happens is that the mains wiring (and connected equipment) acts as a resonance network which can be excited by current bursts, sparks and spikes generated by dimmers, fluorescent lights, power tools and electric motors. Those resonances in fact are interference which can reach your audio equipment either by emitted radio waves or conductance along the mains.

The spark quenching capacitors' built in resistors damp those resonances and help in making things more quiet.

*: If you're sure of some appliances to be noise generators you can of course also equip them with their own mains filter.

DISCLAIMER:

A few tips and hints in this "Hear out your hi-fi system" section of our website give suggestions which involve working with high voltages and/or may cause harm to you and/or your equipment if you make errors or are inexperienced. Especially concerned are the suggestions mentioned at [3-4](#), [3-5](#), [3-7](#), [4-6](#), [4-8](#), [7-1](#), [7-6](#), [8-3](#), [8-7](#), [8-9](#), [8-10](#) and [13-4](#) which explicitly refer to this disclaimer. This disclaimer however applies to all tips and hints given in this document:

A.J. Van den Hul B.V. denies liability for damage or harm of any direct or indirect nature resulting from, or occurring through, activities triggered by this "Hear out your hi-fi system" section of our website.

- Always think twice and be very careful when working with the mains or with other high voltages (i.e. above 40 Volts)!
- Always use a voltmeter to check whether dangerous voltages are present before performing any operations.
- When in doubt regarding any tip or hint given in this document, always ask the help and advice of a professional.

A.J. van den Hul B.V.

Subject Index:

Subject Sections:

- 1: Loudspeakers: [Internal and External Improvements](#)
 - 2: " [Placement and Acoustics](#)
 - 3: Amplification and Amplifiers: [General](#)
 - 4: " [Tube Equipment](#)
 - 5: Cables and Wiring: [General](#)
 - 6: " [AC Power](#)
 - 7: [Connections and Connectors](#)
 - 8: [AC Power](#)
 - 9: [Phono Replay and Turntables](#)
 - 10: [Listening and Sound Quality Evaluation](#)
 - 11: [Buying Tips](#)
 - 12: [Problems](#)
 - 13: [Miscellaneous](#)
- [Disclaimer](#)
-

1: Loudspeakers: Internal and External Improvements (and related subjects):

Burning-in your speakers (1)	1-1
Burning-in your speakers (2)	1-2
Bi-wiring	1-3
Tri-wiring	1-4
Bi-amping	1-5
Loudspeaker bi-wiring and bi-amping cable advise	1-6
Internal wiring (1)	1-7
Internal wiring (2)	1-8
Internal wiring (3)	1-9
Crossover filter components	1-10
Improving sound by removing front covers	1-11
Improving sound by adding weight	1-12
Cabinet resonances	1-13
Measurement and control of panel resonances	1-14
Dented speaker dome; Popping back out	12-5
Damaged woofer; Reconing is cheaper than buying a new one	12-7
A trick to heal older speakers with decentered cones from their buzzing or rattling noises	12-8
Improving the output from a midrange dome or tweeter	1-15
A suggestion for taking amplifier feedback from the speakers	3-4
Spikes or cones; A simple DIY alternative	1-16
How to improve the high tone output of cheaper speaker boxes	1-17
Dull sounding speaker pulse response	1-18

2: Loudspeakers: Placement and Acoustics (and related subjects):

Minimise acoustic feedback to your signal sources	<u>2-1</u>
Good sounding equipment exhibits stable imaging	<u>2-2</u>
The best listening position and spatial reproduction	<u>2-3</u>
Sound coloration; Keep away from walls (1)	<u>2-4</u>
Sound coloration; Keep away from walls (2)	<u>2-5</u>
Sound coloration; Reduction by spreading room resonance frequencies	<u>2-6</u>
Sound coloration; Further reduction measures	<u>2-7</u>
Clapping hands reveals room resonances	<u>2-8</u>
Near-field listening reduces perceived amount of room coloration	<u>2-9</u>
From point receiver to point source...	<u>2-10</u>
Equal distance listening position	<u>2-11</u>
The speakers should face towards your seating position	<u>2-12</u>
Adjusting the speakers' pointing direction for best listening area coverage by using a beam of light	<u>2-13</u>
Too much bass from bass reflex speaker system	<u>2-14</u>
High tones are too pronounced	<u>2-15</u>
Dull sounding speaker pulse response	<u>1-18</u>
Combining multiple small speakers	<u>2-16</u>
On the use of port-loaded speakers in smaller rooms	<u>2-17</u>
Sound coloration; Dealing with a "boomy" sound caused by room resonances	<u>2-18</u>
Keep your tweeters level with your listening position	<u>2-19</u>
Wall reflections can cause a too wide or corrupt soundstage	<u>2-20</u>
Sound coloration; Shorting unused speakers	<u>2-21</u>

3: Amplification and Amplifiers: General (and related subjects):

It is better not to stack equipment on top of each other	<u>3-1</u>
Damping mechanical vibrations improves depth and resolution in replay	<u>3-2</u>
Monoblock power amplifiers always sound better than a stereo one	<u>3-3</u>
A suggestion for taking amplifier feedback from the speakers	<u>3-4</u>
Better sound by adding film capacitors	<u>3-5</u>
Extra cooling can help extend amplifier lifespan	<u>3-6</u>
Better wiring inside power amplifiers	<u>3-7</u>
How to avoid switch-on direct currents from damaging your speakers	<u>3-8</u>
A suggestion for pre-amplifier vibration damping	<u>3-9</u>
Shorting unused inputs	<u>3-10</u>
Bi-amping	<u>1-5</u>
Power your equipment from the cleanest power group	<u>8-2</u>
On AC power cables; Clean sound starts at your power source	<u>6-1</u>
A suggestion to use battery power instead of AC	<u>8-6</u>
A suggestion for clean DIY AC mains power	<u>8-7</u>
Realising a balanced phono pre-amplifier out of two unbalanced ones	<u>9-10</u>

4: Amplification and Amplifiers: Tube Equipment (and related subjects):

Building yourself; A few basic rules	4-1
Collect spare tubes	4-2
Silencing microphonic tubes	4-3
Longer tube life by better preservation of the vacuum inside	4-4
Output transformer distortion due to bias current imbalance	4-5
A tip to measure transformers with interrupted windings	4-6
Output Transformer-Less (OTL) amplifiers and 4 Ohm loads	4-7
Lower bias setting increases power tube lifespan	4-8
Possible sound improvement by swapping your front stage tubes	4-9
Cryogenic treatment of tubes and cables	4-10
Better sound by adding film capacitors	3-5

5: Cables and Wiring: General (and related subjects):

Soldering tips / Mounting connectors to (our) cables yourself	7-5
Sound improvement by using lead-free silver solder	7-8
Better wiring inside power amplifiers	3-7
Avoid strong bending, twisting or pulling	5-1
Cable life and bending	5-2
Cable life and temperature	5-3
Cable life and floor placement	5-4
Cable life and PVC insulated/jacketed cables	5-5
Keep interconnects and AC power cables as far as possible apart	6-2
Keep digital and analog signal cabling separate	5-6
Radio frequency interference problems	5-7
Balanced is better	5-8
Cable shield grounding with RCA connector terminated multicore cables	5-9
Van den Hul cable length markers facilitate the measuring of cable lengths	5-10
On the choice of cable length regarding change of connectors and/or frequent use	5-11
Interconnect versus loudspeaker cable length	5-12
Use the better cables for transporting the lowest signal levels	5-13
General advice with loudspeaker cabling	5-14
Loudspeaker bi-wiring and bi-amping cable advise	1-6
On the quality of loudspeaker cable connections	5-15
Beware of used demo cables	11-6
Experiencing harshness of sound	12-3
Making your own video cables; What to beware of	5-16
A word on analog and digital video connections	7-9
Unbalanced multicable for recording, a suggestion	5-17
Cryogenic treatment of tubes and cables	4-10
On burning-in interconnect and loudspeaker cables (1)	5-18
On burning-in interconnect and loudspeaker cables (2)	5-19
Conductor size in relation to sound quality	5-20
How to provide your speaker cables and interconnects with extra corrosion protection	5-21
Keep speaker cabling consisting of discrete wires pairwise twisted	5-22
Standard supplied cables often don't match the equipment's quality	5-23

DIY Loudspeaker cables made from loosely twisted single leads	5-24
DIY Interconnects made from multiple twisted single leads	5-25
Headphone cable and wiring; Marked improvements possible by DIY replacement	5-26

6: Cables and Wiring: AC Power (and related subjects):

On AC power cables; Clean sound starts at your power source	6-1
Keep interconnects and AC power cables as far as possible apart	6-2
Clean mains power is essential for good music reproduction	8-1
Power your equipment from the cleanest power group	8-2
Power all equipment from a single wall outlet	8-4
Lower your noise floor and open your sound by reducing unnecessary ground currents	8-5
A suggestion for clean DIY AC mains power	8-7
Even transmitters need a clean mains	8-8
Make your own clean audio ground	8-9

7: Connections and Connectors (and related subjects):

Keep all your contacts and connectors clean	7-1
Maintain clean metal contacts with our RCA type connectors	7-2
How to provide your speaker cables and interconnects with extra corrosion protection	5-21
Where possible solder all connections	7-3
Soldering is recommended instead of crimping	7-4
Warning! Never solder at your phono cartridge	9-4
Soldering tips / Mounting connectors to (our) cables yourself	7-5
Electrical connections in older audio equipment (1)	7-6
Electrical connections in older audio equipment (2)	7-7
Sound improvement by using lead-free silver solder	7-8
Better wiring inside power amplifiers	3-7
On the quality of loudspeaker cable connections	5-15
On the choice of cable length regarding change of connectors and/or frequent use	5-11
Balanced is better	5-8
Cable shield grounding with RCA connector terminated multicore cables	5-9
A word on analog and digital video connections	7-9
Shorting unused inputs	3-10

8: AC Power (and related subjects):

On AC power cables; Clean sound starts at your power source	6-1
Keep interconnects and AC power cables as far as possible apart	6-2
Clean mains power is essential for good music reproduction	8-1
Power your equipment from the cleanest power group	8-2
Cleaning electrical contacts helps	8-3
Power all equipment from a single wall outlet	8-4
Lower your noise floor and open your sound by reducing unnecessary ground currents	8-5

A suggestion to use battery power instead of AC	8-6
A suggestion for clean DIY AC mains power	8-7
Even transmitters need a clean mains	8-8
Make your own clean audio ground	8-9
Getting your AC power even more quiet	8-10

9: Phono Replay and Turntables (and related subjects):

Many turntables don't play optimal; Simply adjusting the overhang already does a lot	9-1
Don't set your tracking force too high	9-2
Use a thin and supple tone arm cable	9-3
Warning! Never solder at your phono cartridge	9-4
MC phono cartridge load impedance	9-5
Phono cartridge impedance matching transformers	9-6
A simple method to listen to the resonances in and around a turntable	9-7
A suggestion for a turntable vibration-damping platform	9-8
Hum; How to avoid	12-1
Reducing crosstalk by reversing signal polarity in one channel	9-9
Realising a balanced phono pre-amplifier out of two unbalanced ones	9-10
A record platter made of steel is not ideal	9-11
Two tips to spare your old 78 RPM records	9-12
A tip for a superb broad spectrum applicable lubricant	13-5
Capacitors parallel to the M.M. or M.C. input of pre-amplifiers often are unnecessary	9-13
Replacing the old oil helps to keep turntable bearing noise down	9-14
Improve replay by correctly levelling the platter and tone arm	9-15
Keep turntable bearing noise down; Check the platter bearing's steel marble	9-16
Checking your pick-up arm bearings can improve replay quality	9-17
A suggestion for improvement of the phono pre-amp's cartridge loading resistors	9-18
Cartridge setup needs to be done in the right order	9-19
Mind that your turntable speed setting is correct. Use a strobe disc	9-20
Damping platter resonances	9-21

10: Listening and Sound Quality Evaluation (and related subjects):

Train your ears by listening to natural sounds	10-1
Making your own recordings is instructive	10-2
Listening while reading the sheet music is instructive	10-3
Putting sound characteristics into words is helpful	10-4
What time of day is best to perform listening tests	10-5
When evaluating new equipment take your own cables with you	11-4
Standing while judging or comparing speakers yields one-legged results	11-5
On reviewers' opinions	10-6
Keep in mind that many digital recordings have been manipulated	10-7
Recordings made through computer sound cards often are no good reference	10-8
The quality of some Super Audio CDs is less than supposed	13-3
Distortion from home-burned CDs	12-7

Bad sound quality; It's not always the equipment and/or cables	10-9
The FIRST [®] Ultimate Rings; A different approach to neutralize soundstaging problems	10-10
Listening with your eyes closed	10-11

11: Buying Tips (and related subjects):

Sound quality is more determined by system composition than by money	11-1
Buying second hand equipment is worth considering	11-2
Try out at home first	11-3
When evaluating new equipment take your own cables with you	11-4
Standing while judging or comparing speakers yields one-legged results	11-5
Beware of used demo cables	11-6
On reviewers' opinions	10-6
On the choice of cable length regarding change of connectors and/or frequent use	5-11
Interconnect versus loudspeaker cable length	5-12
Use the better cables for transporting the lowest signal levels	5-13
General advice with loudspeaker cabling	5-14
Standard supplied cables often don't match the equipment's quality	5-23
The quality of some Super Audio CDs is less than supposed	13-3

12: Problems (and related subjects):

Hum; How to avoid	12-1
Radio frequency interference problems	5-7
Interference; A suggestion to use battery power instead of AC	8-6
Interference; A suggestion for clean DIY AC mains power	8-7
Compare with others when in doubt of a component's sound quality	12-2
Experiencing harshness of sound	12-3
Play back at low volume level lacks detail	12-4
Finding the culprit by method of elimination	12-4
Dented speaker dome; Popping back out	12-5
Damaged woofer; Reconing is cheaper than buying a new one	12-6
How to avoid switch-on direct currents from damaging your speakers	3-8
Too low output from midrange dome or tweeter	1-15
Dull sounding speaker pulse response	1-18
The quality of some Super Audio CDs is less than supposed	13-3
Distortion from home-burned CDs	12-7
A trick to heal older speakers with decentered cones from their buzzing or rattling noises	12-8
Bad sound quality; It's not always the equipment and/or cables	10-9
The FIRST [®] Ultimate Rings; A different approach to neutralize soundstaging problems	10-10

13: Miscellaneous

Building equipment yourself is instructive	<u>13-1</u>
Give your kids your old equipment to let them learn by playing	<u>13-2</u>
Good sounding equipment exhibits stable imaging	<u>2-2</u>
Sound quality is more determined by system composition than by money	<u>11-1</u>
Try out at home first	<u>11-3</u>
It is better not to stack equipment on top of each other	<u>3-1</u>
Extra cooling can help extend amplifier lifespan	<u>3-6</u>
Damping mechanical vibrations improves depth and resolution in replay	<u>3-2</u>
The quality of some Super Audio CDs is less than supposed	<u>13-3</u>
Recordings made through computer sound cards often are no good reference	<u>10-8</u>
Recording microphones; Removing the front grid	<u>13-4</u>
Unbalanced multicable for recording, a suggestion	<u>5-17</u>
A tip for a superb broad spectrum applicable lubricant	<u>13-5</u>
A tip to measure transformers with interrupted windings	<u>4-6</u>
Distortion from home-burned CDs	<u>12-7</u>
Good hi-fi equipment doesn't only come from one country	<u>13-6</u>
Keep your listening room a non smoking area	<u>13-7</u>
A superb ignition cable...	<u>13-8</u>

While A.J. van den Hul B.V. provides the information contained in this document to anyone, we retain (joint) copyright and/or publication rights on all text and graphic images. This means that:

You MAY NOT: Modify or re-use the text and graphics, distribute the text and graphics to others, or "mirror" this document's information on another server without the written permission of A.J. van den Hul B.V.

You MAY: Store the document on your own computer for your own personal use, print copies of the information for your own personal use, and refer to it in your own documents or on your website.

A.J. van den Hul B.V. reserves all other rights and is not to be held liable for the contents of this document.

www.vandenhul.com