Marantz 10B Modifications by Giacomo Pruzzo[1]

Power Supply

To be honest, the *Marantz 10B* power supply is maybe the weakest point of all this expensive piece of gear. I do suspect that it has been designed at the end, when the advanced RF and IF strips already consumed a lot of physical space under the chassis, or simply relying too much on the mains supply qualities – especially on its short- and long-term stability.

The latter seems quite a common aspect even in other outrageously expensive equipments made during the late the 50s and 60s, with almost no exception apart from laboratory instruments. In fact there are completely different ways of designing between the real commercial world (even for deluxe editions) and the professional one: Research and development, assembling and wiring were so expensive that circuit complexity was usually kept to a minimum unless strictly necessary. High-end designing in its widest sense, with uncompromising choice of circuits and parts was still to be applied in civilian electronics, e basta[2].

Let's go back to the tuner and concentrate first on the **−270 V** line. This rail supplies the scope CRT, the deflection amplifiers and, most of all, several cathode followers in the signal path.

In the original design, low value capacitors have been used in a half-wave voltage multiplier scheme. As you well know, a half-wave voltage doubler is an elegant device that delivers almost twice the peak input voltage providing a raised anode supply (B+ or HT in old diagrams) with minimum effort and costs[3]. This works nicely if the current drain is limited (let's say, less than a few mA, for low-level), but the ripple content – and here at mains frequency and not doubled! – is rather high, with very poor regulation. The original **10 µF** capacitor is too low in fact to keep the ripple content within reasonable limits, especially with the European 50 Hz mains. Furthermore its regulation (thus the internal impedance of the entire supply) is extremely poor.

A definite improvement is the adoption of a considerably higher capacitor value that can be substituted quite easily, since good quality axial capacitors are much slimmer today than 40 years ago. I have used three premium qualities **47 µF / 350 V BC** capacitors in the voltage doubler and in the following ripple filter, with no increase in size over the original components (a in Fig. 1).

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1 Feel free to contact me but keep in mind that I am rather busy with electronics all the time. In case of needing an alignment, meet me in Italy on vacations!

2 Check out old *Hewlett Packard*, *General Radio*, *Tektronix* or *Boonton* catalogs, and then compare prices to high grade commercial gears like the various *Fisher* or *H.H. Scott*, or the high-priced *Marantz 10B*. Only industry or *NASA* could have afforded such elaborate bench instruments!

3 A voltage doubler can be of the half-wave or full-wave variety, depending the in/out connections. The full-wave type was common in late tube era, for example in the *Marantz 8B* power supply, and can provide very good performance with inexpensive diodes and capacitors. Unfortunately, where a power transformer with center-tap is used, as in the *Marantz 10B*, the half-wave version is usually implemented with two diodes and two capacitors only (i.e., a half-wave rectifier/doubler). Ripple is going to be pretty high especially at 50 Hz mains.

This modification will lower the total ripple in the negative rail – measured after the 56 kΩ resistor standing below the output followers – of more than 15 dB at 50 Hz, and that’s only a benefit. I am pretty sure you will enjoy this during listening, because it cleans the bass response furthermore, while also stabilizing somewhat stereo imaging.

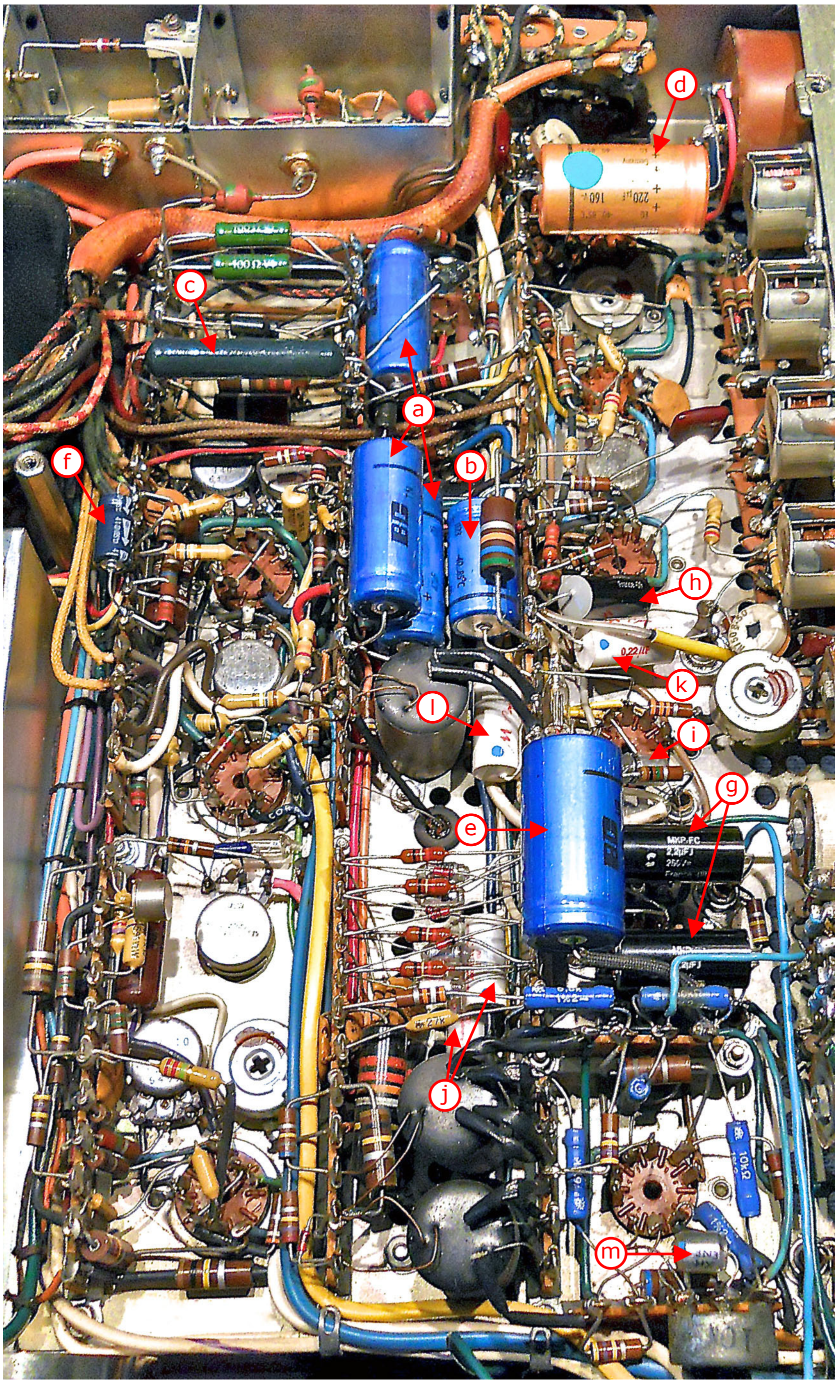

Figure 1. Some of the recommended modifications; in the manual referred to as «a–m»

Supply voltage will increase a little and peak current in the rectifying diodes too. To decrease it at the original or safer value and also for smoothing some diode switching noise while protecting the supply transformer, I simply installed a tiny **47 Ω / ½ W AB** resistor in series with the first capacitor. Now, negative rail is much cleaner, and regulation is even better than the original circuit.

For the same reason the original **20 µF / 150 V** in the two audio cathode follower circuits (V18 and V13A) has been substituted with a beefy **100 µF / 160 V BC** capacitor (b in Fig. 1), further lowering the ripple and low frequency interactions between stages. Again without consuming more room in such a crowded chassis.

The positive supply deserves similar considerations. It was a common practice for that period, using wire-wound resistors of low value to keep voltage drops as low as possible and multiple sections FP capacitors – but too low in value for modern standards. To be honest, in such an expensive product some sort of stabilization for the B+ line should have been employed. Also considering that solid state or hybrid regulators were already used in several professional gears of that period such as *Hewlett Packard*, *Tektronix* and *Fluke*.

The most curious aspect of this design, at least for me as an engineer, is the large voltage drop across the **4 kΩ / 10 W** resistor that feeds the RF stage. A high power loss is unavoidable here and so is the generated heat that unfortunately cannot be dissipated in such a small space! A very well vented chassis would have been mandatory and also a completely different capacitor placing. The FP can capacitors do in fact become rather hot in operation, mostly from heat dissipation from this resistor and conduction via terminals themselves. There is little to do without getting involved in extensive and difficult modifications, which would also be detrimental to the unit value. The only cure is to try soldering this offending part in a way that minimizes heat transfer to the contact strip and to the capacitor itself. This can be done if the original one has sufficiently long terminals to be stretched or better changing the resistor itself with a fresh new one.

In two cases I had to change this resistor due to a sort of fatigue that ruined it after long years of limited operation. Since the value is not a standard one, drop-in substitution is not trivial! A suitable replacement is a wire-wound **4.2 kΩ / 10 W** (c in Fig. 1), while also two in a series configuration **2.2 kΩ / 7 W** proved to work marvelous in another restoration project. A little higher resistance only slightly decreases the RF gain due to a lowered B+ supply, always within dB fractions; EC88 UHF triode brand variety and consistency produces much more wide variations, as misalignment too. So, don't worry, and live with less heat and more reliability!

The RF stages will gain nothing from a cleaner and more stable supply, apart from the local oscillator, that will drift with voltage and will be also modulated by the ripple itself[4]. Here a further reduction in ripple content didn't apparently produce any audible change however (a very large capacitor to smooth out B+ would be necessary here), so I decided to leave the circuit unchanged and to use additional bypasses elsewhere where space permits.

As soon as possible I will run a complete set of new measurements on classic tuners, including spectral analysis on very low frequencies. Using a battery powered low phase-noise oscillator at carrier level, I will try to inspect carefully the low frequency behavior of the receiver and its intrinsic noise. I am rather curious to see how poor designed noisy local oscillators are able to introduce artifacts in the audio band, as theory predicts.

Also automatic frequency control (AFC) loops can be detrimental to the overall quality, along with electronic devices used to add control facilities to the tuner itself (varactor diodes or reactance modulated triodes). Fortunately the *Marantz 10B* is almost rock-steady without any AFC loop, a unique performance in late tube era.

Without going into excessive tweaking, the most effective and practical solutions have thus been firstly, the insertion of a new bypass of **220 µF / 160 V** in the multiplex decoder stage (200-220 V surge during warm-up; d in Fig. 1), because a 38 kHz subcarrier oscillator always deserves a clean supply to operate at its best[5], and secondly, a suitable bypass of **100 µF / 350 V BC** in the audio section (e in Fig. 1). The latter is mandatory for well-known reasons of lowering noise and common impedances at V17 plates, and results are clearly visible on scope/spectrum analyzer while being heard.

[4] Frequency stability is a first-class one even without an automatic frequency control loop. This is due to the careful choice of temperature compensated devices, i.e., components chosen in such a way to compensate relative long-term variations.

[5] A subcarrier oscillator is required in the vast majority of stereo tuners. Pilot tone duplication can be used, but phase-locked 38 kHz local oscillators usually lead to better performance. The *Marantz 10B* circuit is rather sophisticated in this aspect, but noise superimposed on anode supply is detrimental in getting the best demultiplexing, where time or phase errors should be kept as small as possible. Thus, a local bypass will reduce ripple at innocent levels while stabilizing voltage for short time variations.

After a new measurement session a **10 µF / 100 V** has been soldered in parallel to the original 0.1 µF capacitor (f in Fig. 1) to get rid of other mains related artifacts on heater chains and coming from the power transformer internal parasitics.

These simple adds-on complete the supply modifications, and are to my opinion the minima required updates for fully enjoying this wonderful machine, and to do better than original specifications along with increased reliability; the more important, without getting crazy stuffing it with too many new esoteric parts, and thus destroying its original value. In this aspect, please read carefully once again what I have written in the gray paragraph about the modification process itself, and how to approach such kind of restorations.

Audio Section

The audio circuitry in the *Marantz 10B* is quite elaborate, and along with the exclusive IF amplifier, represents a huge improvement on the average HiFi tube tuner of that period.

First of all, because it has been designed with almost no compromises: extensive and expensive filters for removing SCA and MPX tones and signals have been provided, along with low impedance paths with high precision controlled frequency response, plus several other features of course. In that aspect it also requires – and does deserve – very little modifications to perform more than successfully in these days. The few inexpensive modifications I have applied are the logical consequence of the availability of improved new parts and the careful choice of values.

Without going too much into details, since the *Marantz 10B* circuit has been already published and commented in several articles both in the mid 60s and recent years, I only suggest changing coupling capacitors in the signal path, whenever possible. They are so few, and they are old. Modern polypropylene devices are much more performing to the ear too, and in case where the space allows, they can be used in much higher values (3–4 times the original). I usually insist on the latter point. It's not only a matter of further extending low frequency response (and even better for separation constancy below 500 Hz where MPX signal is around) but also to lower the grid impedance toward previous stages, and thus decrease hum and thermal noise.

More, I have made so many aural experiments in the last ten years that I started to appreciate larger bandwidth designs: I am neither saying nor encouraging fragile DC couplings, but at least 5–10 Hz as maximum lower cutoff frequency. This only if you don't have subsonic, with a good stable power supply and a suitable circuit, plus of course an audio chain, able to cope with low frequencies. In my late 20s I did design so many tube gears naturally filtering out very low frequencies (let me say, below 20 Hz) that the first time I got a new power amplifier with no restrictions and a similar tube preamplifier with no limits, I suddenly discovered that I have always missed energy and detail at very low end.

Now, let's go back to the *Marantz 10B*. The first capacitors that do deserve an increase are the two yellow CDE **0.22 µF** in the audio outputs which have been immediately substituted with fresh *Solen* polypropylene of **2.2 µF / 250 V** (g in Fig. 1). To be honest, a 12AX7-based buffer is not the lowest impedance follower to start with. That's OK, but if you load such a tuner with a 10 kΩ preamplifier input, frequency corner will be placed too high at 80 Hz with the original capacitors!

For lowering grid path impedances, keeping disturbances pickup at minimum and ensure almost flat phase response before de-multiplexing, please replace the other yellow CDE **0.22 µF** with a polypropylene of **0.22 µF / 250 V** or higher voltage connecting the detector buffer V13A with V14A (h in Fig. 1).

A cute **1 nF / 100 V** styroflex axial capacitor will be likely to replace the horrible **1 nF** ceramic bypass on V13A grid, before the test point. Again, better capacitors in almost the same space (i in Fig. 1).

To keep the grid impedance into the previous stage very low, the couplings between the two sections of the MPX filters have been updated with *Solen* polypropylene **1 µF / 250 V**. To do this substitution you have to separate the filter sub-chassis from the main cabinet, and I only suggest this for the most «techie» ones – leave them in place in case of doubt.

The small couplings lying under the MPX Bridge are really bad, but unfortunately hidden in such a way that removing them is quite tricky. You can do the job only if you have the right de-soldering tools, a lot of time, patience, plus two marvelous *Mundorf* polypropylene capacitors of the same **0.1 µF / 250 V** or higher voltage. Here space saving is important to keep stray capacitance similar to the original product (j in Fig. 1).

With all these new polypropylene devices the sound will be now accurate without being to bright or even harsh, let me say fresh. The overall sonic appeal and detail level will increase (I have made comparisons side by side, was not drunk nor excited and friends confirmed me), while the low-end energy will surprise you. You should here live music from a concert hall with all those stomp noises and very low frequencies that render reproduction so natural!

Only for reliability reasons, the two last yellow CDE **0.22 µF** capacitors, one before the detector point (k in Fig. 1) and one in the muting switch (l in Fig. 1), can be changed with modern polypropylene **0.22 µF / 250 V** or higher voltage. Since their quality and position in the circuit are not detrimental to the sonic performance, it's also possible to leave the originals in place.

While doing these upgrades, please also have a check on the heaters wires that are not twisted together in order to cancel magnetic fields; but run freely too close to high impedance points, as the buffer grids. If you can, press them gently against the chassis and also move further away from sensible points. What a strange wiring; the rock-solid *McIntosh MR71* is really outstanding in this aspect, while the *Marantz 10B*, beside the advanced design, sometimes misses well engineering practice. The perfect machine doesn’t exist, but you can do it!

De-emphasis

Since I am still living in the old part of Europe with a 50 µs Emphasis FM Broadcasting Standard, a fundamental modification has to be the redesign of the de-emphasis network, able to restore the correct frequency response. This modification will only adapt the tuner to our broadcast system without representing a real upgrade, being substantially mandatory to enjoy the tuner itself. You don’t even imagine how many audiophiles here still insist on using their original *McIntosh* and *H.H. Scott* without changing the equalization (see Fig. 5: beyond 6 kHz the gray graph falls with more than 3 dB well below the red referential one).

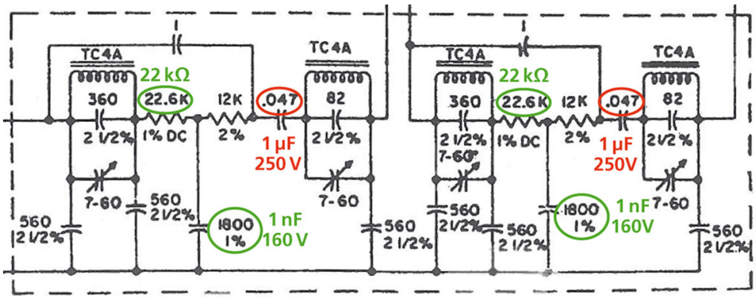

Figure 2. Green shows the new values for the 50 µs de-emphasis

The de-emphasis compensation is realized just before the output stage, after the first amplifying stage and the output follower. More precisely, it's implemented in the same MPX filter that represents quite a unique case (at least in the tube age) of a double passive filter for the suppression of the 19 kHz pilot tone and the 38 kHz subcarrier. This expensive filtering is accomplished with two cascaded parallel-resonant circuits, built around Toroidal Cores labeled as **TC-4A** in the schematic, and an array of fixed and tunable capacitors. In-between the notch sections, a few resistors and another fixed capacitor are inserted to provide the de-emphasis correction itself while taking advantage from the electrical shaping of the notch cells.

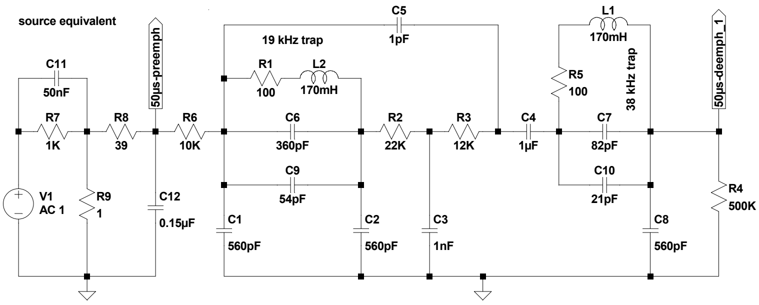

Figure 3. SPICE analog circuit simulator; equivalent circuit to Fig. 2

The **1800 pF** styroflex capacitor is the main equalizing device, but it's not the only one, and that is the reason why the right equalization 50 µs network for the european and most other countries cannot be reached only by scaling such a compensating capacitor! The nominal time constant of this RC network with a **22.6 kΩ** resistor and such a capacitor is quite different from the USA standardized 75 µs. As I said before, this is due to the fact that in such a filter arrangement the right de-emphasis compensation is relative to the very complex interaction of the notch filters and also other circuit cutoff frequencies set by components value.

In the original schematic (Fig. 2), one of the few existing apart from those incomplete that appeared on *Radio Electronics* magazine in July 1966, only capacitive and resistive values have been published. Assuming thus a correct choice of capacitive trimmers, the 19 kHz and 38 kHz notch filters can be implemented only with inductors of about 170 mH. I never measured them with the LCR Bridge to be honest, because the resonant frequency of the two circuits is well known and automatically dictates for such a value, and I didn't want to remove them from the circuit. The actual Q however is not so easily to predict, being unknown to me the exact core material (i.e., the ferrite type), the exact wire resistance plus its skin effect, and also due to the influence of the proximity of the chassis. Anyway, the general behavior of the assembly will be pretty similar with the simulated one as in Fig. 4.

Having played with the output section for quite a long time, I have found that the best capacitor value for the 50 µs de-emphasis is a styroflex component of **1 nF / 160 V** (2.5% or better). With a value of **22 kΩ / 0.75 W**[6] instead of the original **22.6 kΩ**, the behavior

[6] As you have read in the text, a few resistors in the signal path have changed, mainly in the MPX filter. In general, check with the right multimeter for actual value of the original blue precision resistors. Once I had to substitute the anode load due to a defective V17 that burned out a 10 kΩ resistor. In any case, recommended substitutes are metal film, 1% / 0.75 W *Welwyn* resistors from *RS* (codes 149–852 for 22 kΩ), vintage *Dale* or *IRC* are also notable, but the sound will be duller.

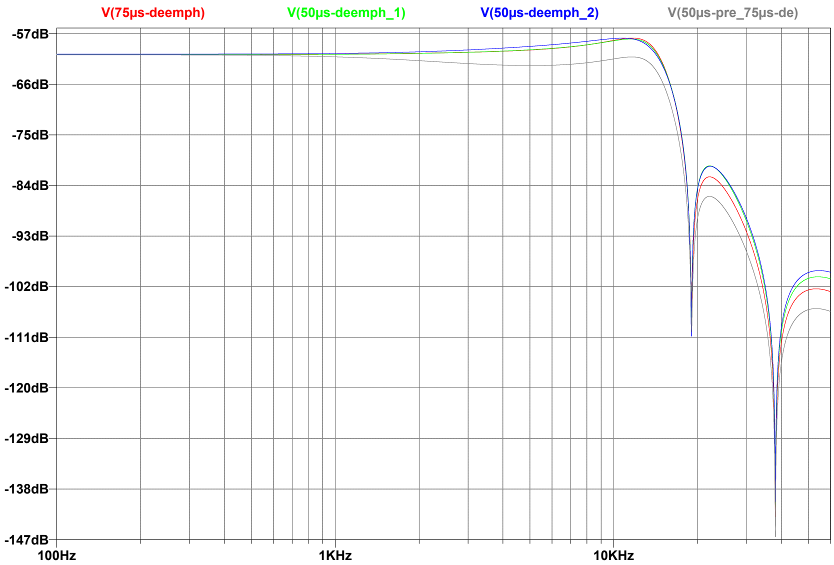

Figure 4. LTspice simulation of the 19 kHz and 38 kHz output filters and the frequency response; red: original Marantz 75 µs de-emphasis with 75 µs pre-emphasis; green: recommended 50 µs de-emphasis with 1 nf and 20 kΩ; blue: 50 µs de-emphasis with 1.2 nf and 16 kΩ; gray: incorrect 75 µs de-emphasis with 50 µs pre-emphasis

of the tuner is linear within 1 dB until 15.5 kHz, and this is not so bad (green graph in Fig. 4 & 5).

On the contrary, with values of **1.2 nF** and **16 kΩ** that were found on a Marantz factory service note on a supplied circuit diagram (dated 1969) frequency response is slightly overcompensated in the range of 6 kHz (blue graph in Fig. 4 & 5).

Again, my suggested value for the de-emphasis capacitor is slightly less the one computed. A simple rule, as it happens to be in several tube circuits with high impedances. As a general rule, given a normalized value of the original de-emphasis capacitor equal to C_{de} for a 75 µs design, optimum capacitors are more likely to be in the range of 0.55 to 0.65 C_{de} for the 50 µs version of the same circuit; the lowest for the very vintage devices with outrageously high impedances, the highest for newer designs or early solid state.

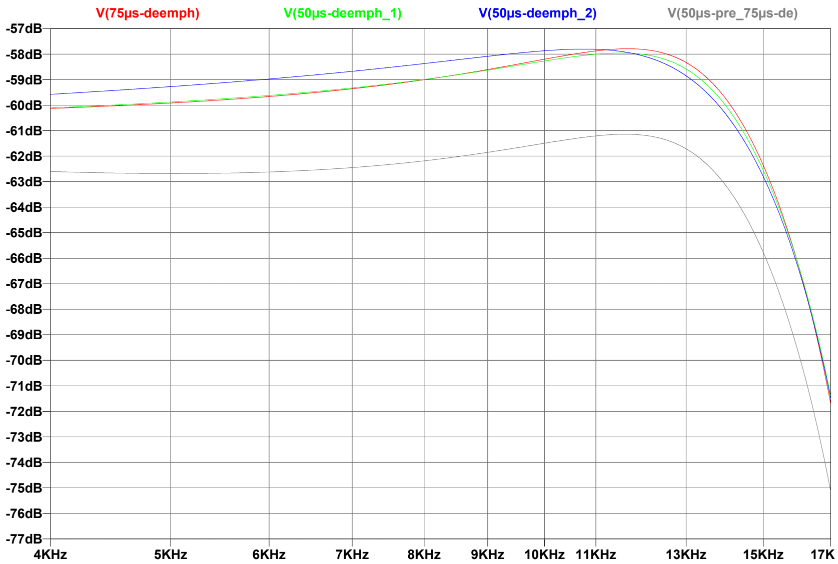

Figure 5. Zoom of Fig. 4: the green graph represents the recommended 50 µs equalization which fits accurately to the red reference; pretty well fits the simulated blue graph

Anyway, the exact value can be found only by using a suitable, highly accurate FM generator and laboratory grade MPX generator. Even the old venerable *ST 1000A* and *ST 1100A* combination from *Sound Technology* is marginal in this aspect, being the acceptable limit for serious work. I am not saying they are rubbish, but that they offer today the minimum required signal quality for successful benchwork. Luckily enough, better *Panasonic*, *National* and *Radiometer* setups are now available on the second-hand market, cheaper also than the overvalued ones from *Sound Technology*, and can be used to align high performance discriminators and decoders to better than new specifications. More on this subject in the next chapter anyway.

Alignment

The *Marantz 10B* was originally conceived to require little or no adjustment at all. This is true concerning the IF filters, but not for the complete design! In fact, the limiter stages and the frequency discriminator itself do employ adjustable capacitive trimmers that were installed for such purposes.

Figure 6. Marantz 10B being measured on the workbench; warm-up at least an hour long

Advisably, the IF strip has to be left untouched, partly because the special filters are hidden inside their shields, and dismantling them for alignment will probably make re-assembling quite difficult, and due to the fact that they are almost impossible to tune exactly as they were meant. And even if they have drifted, it will be better to have them slightly out of adjustment than totally misaligned. They were put in an oven during testing, and tuned exactly at proprietary conditions, which are almost obscure or unknown.

Beside every myth and speculation on the subject, the discriminator stage would benefit from a serious alignment, at least for keeping the distortion as low as possible. The high performance IF strip and the FM decoder itself can lead to a very linear behavior in phase and amplitude, more than an order of magnitude better than other tube tuners of that period – almost all others!

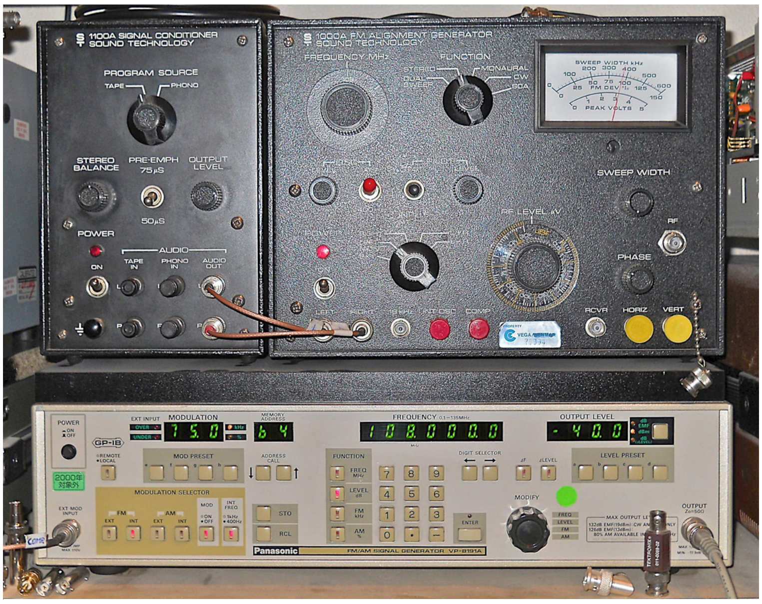

Figure 7. Panasonic VP-8191A generator fed by the Meguro MSG-211G-1; alternative setup with the ST 1100A signal conditioner and the ST 1000A FM alignment generator; both set for -40 dBm @ 108 MHz and 75 kHz deviation

So, to keep the specifications up to date, or even better, a good job is required. And I mean a skilled one: Please don't do that if you do not know how to, nor leave it to the first hobbyist or TV repairman, with less than top test generators.

To do this, and to carefully provide maximum sensitivity and selectivity along the FM band peaking up the RF stages too, you need a suitable FM generator plus several other accessories and tools. The trouble is that very few gears have been produced with sufficiently low FM distortion and high precision for the stated tasks! Even in the large *Hewlett Packard* catalogue or such of other high grade instrument manufacturers, RF generators able to supply a high quality frequency modulation are rare and expensive. Prime audio manufacturers used in fact especially modified units.

Figure 8. Meguro MSG-211G-1 as the main stereo encoder; Marantz 10B stereo measurement at 1 kHz with about 75% of the maximum allowable modulation, including 8% pilot tone

In that sense, the introduction of the famous *Sound Technology FM1000* generator specifically devoted to this function, was more than welcomed in the 70s, allowing several laboratories and advanced repairmen to design and align HiFi gears with ease, and without going bankrupt. 30 years later the situation is a bit different, since better receivers have been issued during the following two decades, along with top specifications, as improved detection linearity and stereo separation. These units call for FM generators with modulation linearity better than 0.1%. The *ST 1000* with very careful modifications can reach 0.07%; but you need special discriminators to do this check[7]. And as I have said before, newer instruments from *Panasonic*, *Meguro* and *Leader* are available at similar costs and even better characteristics. Remember that, if you want to align the tuner for THD + Noise in the region of -57 to -60 dB, you need a generator with at least 6 dB of better linearity. If not, there is a risk of transferring generator errors into the tuner circuitry, or cancel out certain simple nonlinearities[8].

For the curious technical guy, get the old *HP 202H* generator manual and the *Boonton Notebook*, issue 34, where considerations on FM generators and FM fidelity are covered together with suitable characterization methods.

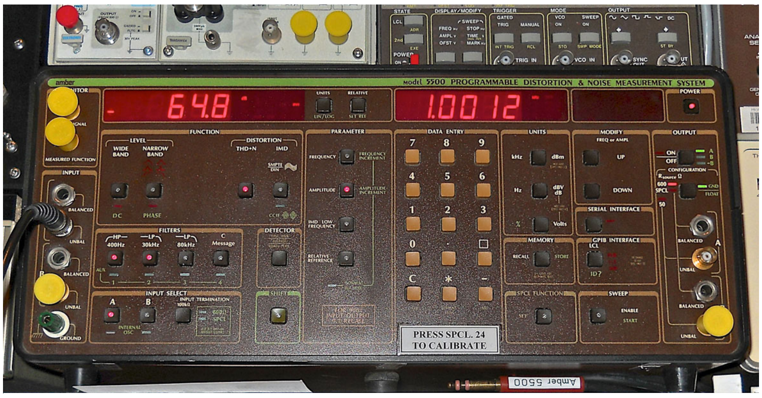

Figure 9. Amber 5500; THD measurement with bandwidth limiting of 400 Hz and 30 kHz; output trimmer set for 500 mV RMS at output; signal source set as per Fig. 7; input at Marantz 10B antenna terminal via a balancing transformer approximately -42 dBm

In case of doubt, align at 50–60 kHz of deviation instead of 75 kHz, especially when using the venerable *ST 1000*, since linearity begins to deviate from ideal behavior after that. At normal modulation level, a serious Broadcaster is using deviation figures quite distant from the maximum allowable 75 kHz.

The *Marantz 10B* discriminator is aligned via two capacitive trimmers. The primary one tunes for best linearity, while the secondary one sets the central working point, or the detector «zero». The transformer itself is very well designed and executed, and together with a careful choice of diodes and driving impedances, the linearity – when properly aligned – is very good. Unfortunately, it's neither stable mechanically nor easy to adjust: Every single displacement or relative movement of parts will destroy the equilibrium; so even if you will be excited of reading -65 dB on the THD meter while adjusting the primary capacitor, a few

7 To align high quality FM generators you usually need much more specialized instruments like standard discriminators or far better, calibrated modulation analyzers. Other special measurement techniques that don't rely on accurate discriminators can be used, but they are time consuming and very prone to operator errors.

8 The subject is too complex for elementary treatment; this is the reason why it's much more convenient to use considerably better signal sources to stay always 6–10 dB below expected nonlinearities.

movements later or 15 minutes of warming up, THD will increase for the lost balance. Therefore the mechanical assembly cannot be modified without entering too many difficulties. So please, once aligned, never apply force to its can, only patience and a right procedure will lead to rather spectacular performance.

Supply the IF chain straight at its input with an unmodulated accurate signal at 10.7 MHz, and try to align it with a sturdy plastic tool, with a sufficiently strong and close-fitting insert to turn the trimmer without being broken. Tune secondary at first for a 0 V DC reading at the junction of the 1 MΩ resistor and 1 nF capacitor after the decoder (before test point on V13A grid), using an insulating resistor of at least 100 kΩ in series with the multimeter probe. After that, disconnect the multimeter and apply the usual 1 kHz sinusoid and tune primary for lowest THD + Noise with usual band pass limiting of 400 Hz–30 kHz or less. Be very patient and check it within several iterations, when the tuner is hot and stable, maybe checking again for static balance (0 V DC, as before)[9]. After that, switch it off, cool down, have a coffee and a short walk outside, then check again one hour later! A few iterations will be necessary, and time will slip away easily.

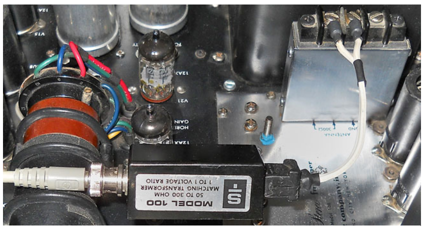

Figure 10. 50 to 300 Ω; voltage ratio 1:1

The stereo decoder is quite elaborate, and I will not discuss its design here. I only comment the fact that it's almost maintenance free since it doesn't need any tricky alignment, typical for tube decoders of much more common design. As you can see, the inductors are toroidal (once again!) and free from every kind of instability due to moving ferrite cores and mechanical jokes.

If the decoder subsystem has never been dismantled nor separated from the mainframe, the chance it has been misaligned or drifted is rare. Being almost fixed, the only aging parts are the tubes themselves, and especially the oscillator double triode: A premium grade quality tube is mandatory, free from ripple, a long lasting and stable type as the 12AU7A or the professional 5963, 5814A and other equivalents. In stereo operation, with a pilot tone at its lowest level (4–6%) that still triggers the decoder, you can measure the switching frequency on the matrix diodes, with a very low capacitance 10:1 probe, and then choose the 12AU7 that oscillates closest to 38 kHz – after having warmed it up for at least 20 minutes, of course.

Figure 11. Siemens & Halske triple mica; the best, and hard to find!

The only important adjustment, as usual, is the separation control, here provided by the 10 kΩ trimmer between the V17 cathodes. This is quite a common arrangement that simply injects out-of-phase signals in the right point to reduce diaphony, thus enhancing channel separation. As usual, this alignment requires a MPX generator able to supply a high quality stereo signal with high, constant stereo separation across the audio band,

9 For THD (or THD + Noise) measurements I do assume that a suitable analyzer is available. It has to be connected to the output with gain set at maximum. For alignment purposes a classic basic distortion analyzer (like the *HP 339*, *ST 1700*, *AMBER 5500* and others) will be fine, especially with suitable band pass filters to suppress mains related disturbances and high frequency garbage (as in stereo measurements, see next paragraph). With a standard tone of 1 kHz most of the characterization can be made, but for a complete sketch of performance tests other frequencies can be used, along with a spectrum analyzer to closely inspect harmonic content. Testing the *Marantz 10B* for linearity is however straightforward due to the MPX filter that helps getting valid THD measurements and keeps garbage out of them. The only requirement is a very linear and clean FM generator.

and a very broadband linear FM generator (in case of two distinct entities, and no integral design like the *ST 1000A*, be extremely careful when interfacing stereo encoders and FM generators).

Figure 12. Along with my Radiometer SMG1 generator, this is one of the most after sought all tube stereo coder: the almost impossible to find Boonton 219A; formerly an Hewlett Packard generator made by the Boonton Radio Company

After having tuned the *Marantz 10B* on a strong carrier in the upper region to avoid interferences (108 MHz for example), trigger the system on the simulated stereo emission with the usual pilot tone at 8–10% of the system deviation, and modulate with the composite signal slightly less than the maximum 75 kHz deviation to stay on the safe side. After the decoder has been switched on for a while, turn the trimmer for best separation. At 1 kHz it should be at 40 dB or above, and still more than 30 dB at 5–6 kHz. Again, I insist, the latter high frequency measurement does require a premium stereo encoder of modern design, to be meaningful. In absence please align at 1 or 2 kHz as a maximum, especially with normal garden-variety *ST 1000s*.

During experiments, I realized that a high frequency correction via a **3.3 nF / 160 V** styroflex axial capacitor in parallel with the trimmer itself (m in Fig. 1), may lead to a better separation until 10 kHz; slightly depending on test conditions (pilot at 8% modulation level and 50 µs pre-emphasis). In one case, optimum separation reached 48 dB and remained quite constant from 200 Hz to 8 kHz, decreasing a few dB only after 10 kHz. That is a very nice and impressive result[10].

[10] How many tuners do exhibit separation figures that follow an «U» or depressed behavior, with stereo separation that reaches 35–40 dB in the proximity of 1 kHz, but fail below 300–400 Hz and after 3–5 kHz! This is quite common in old designs (both tubes and early transistors) and reflects ingenuity and limits in those old circuits, especially the commercial ones. A wrong IF band pass and a bad limited frequency/phase response always lead to a poor separation, but things are particularly worsened beyond a few kHz. The latter, especially when de-emphasis is applied immediately after the de-multiplexing and before the audio stages where partial crosstalk compensation is used via cathode cross couplings. To improve these figures, apart from choosing much better performing architectures, try to ensure maximum bandwidth after the discriminator (or the inferior ratio detector), and try to compensate for diaphony before applying the de-emphasis filters, and the MPX ones. Going stereo to 15 kHz requires flat frequency responses from 10–100 kHz!

Sound of Music at its Very Best

This instruction manual and the belonging circuit diagram are made – in all conscience – for the enthusiasts of this beautiful device and in return that the *Marantz 10B* keeps alive and radiates joy for other tens of years at its very best.

Please keep in mind that these suggested improvements are recorded for your personal use[11] and for informational purposes only; and are to anyone provided in «as is» condition, and therefore without warranty of any kind.

Belonging to all the described modifications [you will find here]() the linked schematic.

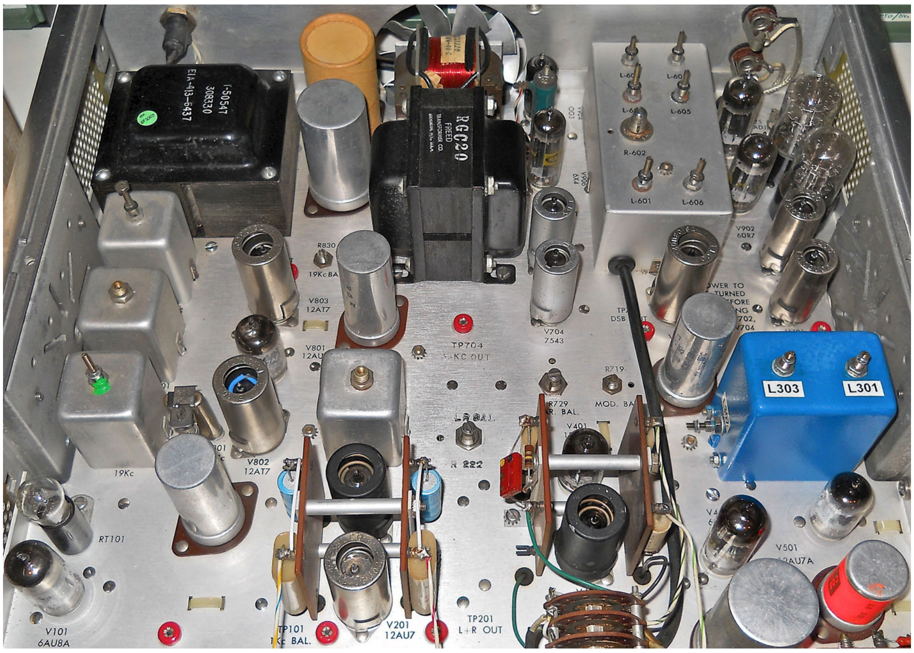

Figure 13. Inside the venerable Boonton 219A; tons of tubes and an excellent sound as encoder, but Meguro definitely produces a better stereo pilot

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Restore, Modify or Upgrade?

What a formidable question or dilemma to answer! I have been interested in collecting, refurbishing, restoring and upgrading electronic gears and vintage audio equipments since about 20 years, and several times I have asked this fundamental question myself.

In such a long period, I have been lucky enough to meet several experienced technicians and skilled engineers who have been involved in state-of-the-art industrial research and design for years in the late 50s and 60s. From these dignified old guys, but not only, I tried to learn how to design, or better how to compromise. But being so seriously interested in old equipment, I knew what were the original goals and achievements in professional tube equipments (and I mean those of correct design), and how to be successful in restoration, maintenance and upgrading existing ones.

I was also lucky enough to inherit two huge technical libraries from an industry R&D laboratory and retired senior designers. These were full of scarce and very precious publications, and you well remember that in the late 80s the Web was still to come, and with it almost forgotten books and papers (Radiotron Designer's Handbooks, complete Philips, Mullard and FIVRE data sheets – and I mean ALL – plus annuals of Proceedings of I.R.E., A.E.S. publications and Brüel-Kjær or Hewlett Packard journals).

I thus have had the opportunity and the privilege to discuss many aspects in tube equipments, with people that were used to study on those papers, also contributing to their writing! OK, maybe they were neither of Saul Marantz or Peter Walker caliber, nor demitted only to audio (at least for work). But, most important to me, they have been married for a lifetime with electronics and tubes; and I mean tons of tubes.

Very soon I started to collect audio equipments while being also interested in modern so-called hi-end systems, thereof the restoration process was born automatically. Since I was interested in getting usable items with decent specifications, I started to consider how to do the job: strip it all and rebuild with new parts, or simply clean and keep them with minimum changes on the shelf? It depends on the final destination, and very personal taste and philosophy.

If you want to use a piece of equipment that has been designed at least 20 years ago you have to consider at first its value. Sometimes it's a complete waste of time or money, trying to make poor or mediocre systems perform better. You cannot get a Ferrari simply by changing the color or the tires! I am concerned when I see old commercial grade amplifiers and receivers heavily tweaked and modified in order to get spectacular sonic results and so on. They were meant as good commercial grade systems, but specs were on the lower side even when they left the shop. Thus getting a slight improvement can be impossible or too expensive.

It's always a matter of balance and careful compromise. No one is used to make miracles on earth, as the saying goes here in Italy. Except Mr. Berlusconi, of course!

On the other hand, if the original design is good or outstanding, and likely to offer very well results even today, or has no commercial equivalent, a complete restoration and cautious upgrade is well worth. The Marantz 10B, along with a few other items from McIntosh or Leak and Quad here in Europe, they ALL do deserve utmost respect and a few upgrades to perform better than new. Improved parts that simply were not available in these days, can really make the difference, especially after an accurate alignment – and this is not easy, although the most important.

But, and I insist, never stress the original design and carefully evaluate if a simple restoration will make substantive justice without impairing the item value. Changing a few capacitors and resistors is quite different from tearing out nickel-plated RCA plugs, the original power cord or substituting tube types.

Very recently I had to restore a poor McIntosh MR71 tuner, seriously abused with new holes on the chassis and a DIY variety output stage (oh, what an expert technician did the job with glue and surplus capacitors, even being paid by the lucky owner!). Do you imagine how much this restoration back-to-original did cost? How many hours of bench work? The owner spent quite a lot to have it ruined and restored again!

Also, stay away from a too fashioned, new looking item: I would never buy a black painted QUAD II with an IEC supply connector and WBT gold speaker terminals! Apart from that, it's also true that with no service or alignment at all, and the more complex and expensive the apparatus is, all the bigger will be the delusion. Always keep this aspect seriously in mind when buying vintage HiFi, considering all the so-called hidden costs.

Già

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