HIGH QUALITY

RIAA CORRECTOR

Cristal

Part 1

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This article can be taken both as an introductory part to further publications dedicated to the RIAA proofreader, and as a commercial advertisement (customization is possible), and
as a desire to simply brag about a successful result. The corrector has excellent objective ha
characteristics, and most importantly - it sounds great.

The corrector is designed to work with heads of the MM type and has the following objective characteristics:

Gain (1kHz) Recommended input level
Input impedance Input capacitance (adjustable, step ÿ
27pF) THD (1kHz, Uout=0.5Vrms) Noise level (not
weighted) Background level Crosstalk level (20Hz - 20 kHz)
Overload capacity Maximum output voltage THD (1kHz, Uout=45Vrms) Output
impedance Rated load impedance Minimum load impedance Built-in correction
characteristics Characteristic deviation from the standard (20Hz - 50 kHz) Built-in
low-pass filter Supply voltage Power consumption Time to ready for operation
Operating temperature Number of blocks Single block size Kit weight

ÿ 100
2÷5mV
47kÿ±0.1%
90÷310pF
0.02% -67dB
-77dB -78dB
+40dB
45Vrms
1.2% ÿ 50ÿ

47kÿ
10kÿ
eRIAA, RIAA, user
±0.1dB
IEC RIAA
220VAC±10%
120VA 120s
+10÷+30ÿ° 2
170×360×95mm

12kg

It is difficult to give a subjective assessment, you need to listen to him, but at the moment, no one has said anything yet.
room that you don't like.

To achieve the desired parameters in terms of background and noise levels (I myself set the initial bar quite high and then tried to jump over it myself), the corrector was made two-block. One block is the corrector itself, the second is the power source. Blocks
interconnected by a multicore shielded cable with
connector power.

The corrector is implemented on finger lamps. Conditionally possible
consider that it is three-stage, the frequency correction circuits are lumped, passive.
Chains of the general OOS are absent.

The input stage is made on a low-noise triode 6S3P according to
classical circuit of a battery-biased resistive amplifier. Quite a long search for the optimal solution of the input circuit
cascade led me to the conclusion that this option is the most balanced in terms of parameters. Some operational

the inconvenience associated with replacing the battery is compensated a hundredfold
excellent settings.

The second stage is a cathode coupled amplifier with a dynamic load. The cascade allows you to get a small and stable input capacitance, high gain and excellent linearity with satisfactory noise performance. In a cascade with equal success you can use quite a few different types of lamps - 6N1P, 6N23P, 6DJ8, ECC31 (and you will never determine by ear which lamp is worth it).

Between the first and second stages included frequency-correcting circuits switched by signal relays. There are two standard correction characteristics, but the board provides space for the components of the third correction circuit, the characteristic of which is consistent with customer.

A powerful cathode follower is used at the output of the corrector (current rest of the output lamp about 20mA) with a choke in the cathode circuit. Such the cascade, in contrast to the classical circuit, has a symmetrical impulse response for signals of both polarities under a capacitive load. Therefore, the corrector is insensitive to the quality and parameters of the interconnect cable used, as well as, in fact, to the resistance loads. The output lamp is a 6Zh52P pentode in a triode connection.

In general, consider separately the second stage and the output follower not entirely correct, there are additional connections between the cascades. Together, both stages form a linear broadband amplifier with a power band about 15Hz ÷ 250kHz.

Since all cascades in the corrector are asymmetric, it is natural that even harmonics predominate in the distortion spectrum, or rather, only one second (up to the output signal level 8÷10VRMS). At the maximum output signal, the distortion spectrum becomes wider, the maximum recorded harmonic is the sixth, with a level of about -90dB. In general, the power distribution of the distortion products (at maximum output signal) - characteristic of any good single-ended amplifier.

To eliminate clicks when turned on, a relay is used that keeps the corrector output shorted for the duration of transients, and a timer that controls it. Simultaneously with the operation of the relay, the LED on the front panel lights up, signaling readiness for operation.

those.

Structurally, the entire corrector circuit is assembled on one printed circuit board. Such a solution has a number of significant advantages over the classic options. Firstly, it ensures good repeatability of the device, since the circuit is quite sensitive to the installation topology. Secondly, it allows you to use SMD components and ensure the optimal layout of cascades. Thirdly, this made it possible to isolate the entire board from vibration, and not just the input lamp, since, unfortunately, not only lamps are subject to the microphonic effect.

In the case of the device (rather heavy - more than 2 kg), the board is suspended on eight springs, which absorb approximately 90% of its weight. Ten percent of the board's weight is taken up by a soft arched rubber profile located along its contour; at the same time, it is also a vibration damper. This is, of course, a troublesome solution, but very effective.

When designing the power supply, the focus was on minimizing the level of its own noise and the maximum suppression of network noise.

Naturally, all supply voltages are stabilized. Main rectifiers (filament and anode voltage) are made according to a symmetrical full-wave circuit with inductive filters, which significantly reduces the magnitude of the pulse currents flowing through the source circuits. Incandescent The rectifier uses Schottky diodes, and the anode rectifier uses a kenotron. The anode stabilizer is two-stage. The first stage is located in the power supply and is common to both channels. Channel stabilizers are located directly on the corrector board. As a result of the measures taken, it was possible to bring the noise level of the anode voltage up to 100µV and eliminate the influence of the channel fishing for each other.

The source uses a transformer of a special design, with double shielding, which makes it possible to reduce the throughput capacitance between the corrector circuits and the network to 120÷130pF and forms a filter with elements of the secondary circuits, which suppresses both common mode and differential mains interference. The filter effectively operates in the frequency range from units of kilohertz to units of megahertz. The transformer operates with a significantly reduced inductance, which makes the source insensitive to mains voltage asymmetry. In practice, the source is insensitive to the quality of the mains supply (a mains voltage jump of 15–20 volts at the output is simply not registered), and does not require any additional filters, which makes manipulations with network cables completely meaningless.

Particular attention was paid to the choice of types of corrector components. So that the corrector does not became insanely expensive, the selection was carried out differentially, depending on the location component, the influence of its imperfection on the final result and, accordingly, the requirements for its parameters were determined. Interestingly, in the end, the corrector did not contain a single component listed as an audio brand. Approximately half of the brands have insufficiently complete documentation (I'm not saying that the components are bad, just there is no complete data), and the second half is noticeably inferior in terms of parameters to high-quality components of general industrial application. opinion.

When selecting capacitances for signal circuits, the main criteria were: loss tangent, type dielectric, parasitic parameters and stability. For resistors - the level of intrinsic noise, linearity, stability. More specifically, nichrome non-inductive precision resistors are used in the input stage, and film metal-dielectric resistors are used in the remaining stages. Through-hole tanks are made of polypropylene, frequency-setting circuits use precision polycarbonate and

mica containers. The accuracy of the components used in frequency-setting circuits is no worse than 0.5%. For switching frequency-setting circuits, special signal relays with a rated value are used thermoelectric power of a contact pair. The lamps in the circuit are selected in pairs: for the first two stages - in terms of gain and noise level, for the output - only on strengthening.

Finishing the general description of the device, I would like to note that, although a complete diagram of the device will be published later, it is of little use for repetition in amateur conditions. A business not so much in high cost. Three winding units with complex manufacturing technology and with stringent electrical requirements, the use of specific components, the availability of a fleet of precision measuring instruments for component selection and tuning - all this can be an insurmountable problem for hobbyists. So this article, as well as further publications, should rather serve as an illustration of the approach to designing such devices, and individual technical solutions can be used in other designs.