HIGH QUALITY

RIAA CORRECTOR

Cristal

Part 2

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Scheme

The diagram of one channel of the corrector and auxiliary common circuits is shown in Figure 6. The second channel is completely identical. The relays of the second channel, which control the characteristics of the correction, are connected in parallel with the corresponding relays of the first, to control the low-pass filter rum uses different contact groups of the same relay.

About the first cascade, in fact, there is nothing special to say. Classic fixed-bias resistive stage with minimum components. This asceticism allows full use of the good noise characteristics of the lamp. The intrinsic input capacitance of the stage is approx. 90pF.

From the output of the first stage, the signal enters the frequency setting circuits through the capacitances C4, C5 and resistor R8. A large separating capacitance helps to reduce the noise level of the corrector in the region of the lowest frequencies; for the same purpose, the grid resistor (R7) of the VL2: 1 lamp is installed in front of the frequency setting circuit. Resistor R8 brings the output impedance of the first stage to 3 kÿ (typical value ranges from 2.2÷2.5 kÿ). The parameters of the frequency setting circuit are calculated based on the normalized value of the output resistance.

It is clear from the diagram that relay K1 switches the main and additional frequency-setting circuits, and the relay K2 modifies the characteristic of the main frequency chain from eRIAA to RIAA. In the next In the modifications of the corrector, the number of additional frequency-setting circuits was increased to four. Note that the relay must be switched using a non-break-through switch to avoid hanging the grid of the VL2:1 lamp in the air.

As mentioned earlier, the second stage is a cathode coupled amplifier (VL2). His little and stable input capacitance ensures favorable operating conditions for the frequency setting circuit and significantly reduces the dynamic frequency and phase distortion of the corrector.

To increase the linearity of the stage and increase the output voltage swing, the amplifier tube (VL2:2) is dynamically powered. The dynamic power supply is based on transistor VT1. The operation mode of the cascade is set by the current source (VT2, VD1, R20), the divider (R24, R25) in the VT1 gate circuit, and the resistor R18. The parameters of all components are coordinated, and the cascade mode is optimized for the 6N1P lamp (also well suited for 6N23P and its analogues). Transistor VT1 is excited through capacitance C14 directly from the output of the final repeater. The cascade has an interesting property: when the output is overloaded, the coefficient automatically drops amplification, and the output current of the follower is smoothly limited.
The value of the separating capacitance between the second stage and the final repeater determines characteristic of the corrector in the low-frequency region. In fact, this capacitance, together with resistor R28, form a filter, the cutoff frequency of which is determined by the state of relay K3. Resistor R23 serves to equalize potentials and eliminate clicks when switching relays.

The output follower uses automatic bias, which is set by resistors R31 and R32 (respectively, the follower's quiescent current is set by resistor R32). On the grid lamp, it enters through the filter R29, C22. The filter time constant is chosen very large - about 50 seconds. This makes it possible to almost completely eliminate parasitic modulation of the bias voltage by the output signal. Reverse medal long filter time constant is a large cascade entry time into mode. To reduce the voltage at the anode of the repeater lamp to an acceptable value, a VD8 zener diode is used.

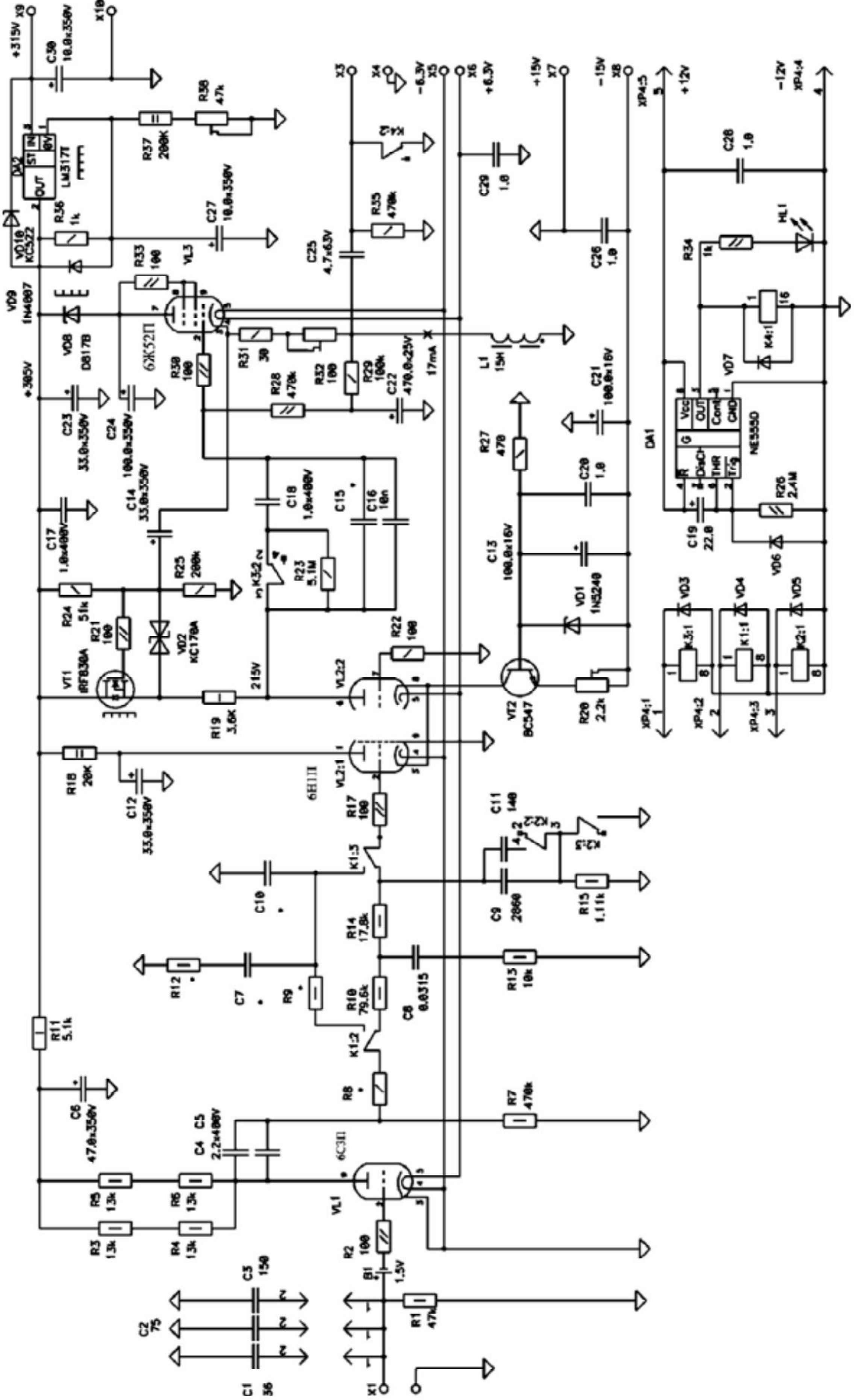
LM317T
NE555D
BC547
IRF830A
1N4007
1N5240
KC522
KC170A
D817B
6Ж52П
6Н1П
6С3П

Figure 6

The use of a zener diode instead of a resistor makes it possible to exclude parasitic modulation of the anode voltage of the follower in the region of the lowest frequencies. The output signal is taken directly from the inductor through capacitance C25.

The channel anode voltage stabilizer is made in the form of a weighted source on three-terminal stabilizer DA2. Zener diode VD10 and diode VD9 protect the microcircuit at start-up corrector and during overloads.

The relay that opens the corrector output after the end of transients is controlled by the DA1 timer, which is switched on according to the standard scheme. The timer delay time is about 120 seconds.

The power supply circuit is shown in Figure 7. Actually, the stabilizers themselves are no have no features. The main feature of the source is the use in the main channels rectifiers with filters starting with inductance. This makes it possible to significantly reduce the noise level generated by the source, but leads to the complexity of the design of the transformer. The power transformer itself is made symmetrical, with double electrostatic shielding and partial magnetic shielding (in accordance with the recommendations given in [one]). It should be borne in mind that each source channel is connected to the corrector with two wires, and the common point is formed directly on the corrector board. The housings of the blocks are connected by a separate wire, and the interconnect cable itself must be shielded and connected to the housings from both sides. sides.

Details

The input stage uses precision film nichrome resistors of the type MF25 (Royalohm). In frequency-setting circuits, precision (not worse than 0.5%) metal-dioelectric resistors of types C2-29, C2-36, group A, with a noise level of not more than 1μV/V, are used. If the accuracy of the resistors is worse, then it is necessary to make a pairwise selection for the channels. The rest of the schema The corrector used resistors such as MOR, MGR (Royalohm) and C2-23. The type of resistors in the power supply is not critical, but you should pay attention to the stability of the resistors in the circuits. dividers that set the output voltage (R4, R8, R15, R16). Trimmer resistors R20, R38 type RJ24 (Bourns) resistor R32 - SP5-2.

Capacitors of the MKP10, FKP1 (WIMA) type are used directly in the signal circuit. In frequently setting circuits, precision capacitances of the SGM-1A, K31-11, K71-7 types are used. If the accuracy capacities worse than 0.5%, it is advisable to make a pairwise selection. The type of film containers located in power circuits is not so important. Of course, it is desirable to choose containers with a minimum the value of the loss tangent. The types of electrolytic containers in power circuits, in general, are also not are especially critical. Most manufacturers' standard series containers work well.

I want to draw the attention of readers that the semiconductor components used must be of high quality. It means that if IRF830 is written on the transistor, then it should be manufactured by IRF and not unknown by whom. Particular attention should be paid to the quality zener diode VD1 (Fig. 6). From its short-term stability and noise level, it is significantly hanging noise characteristics of the entire corrector.

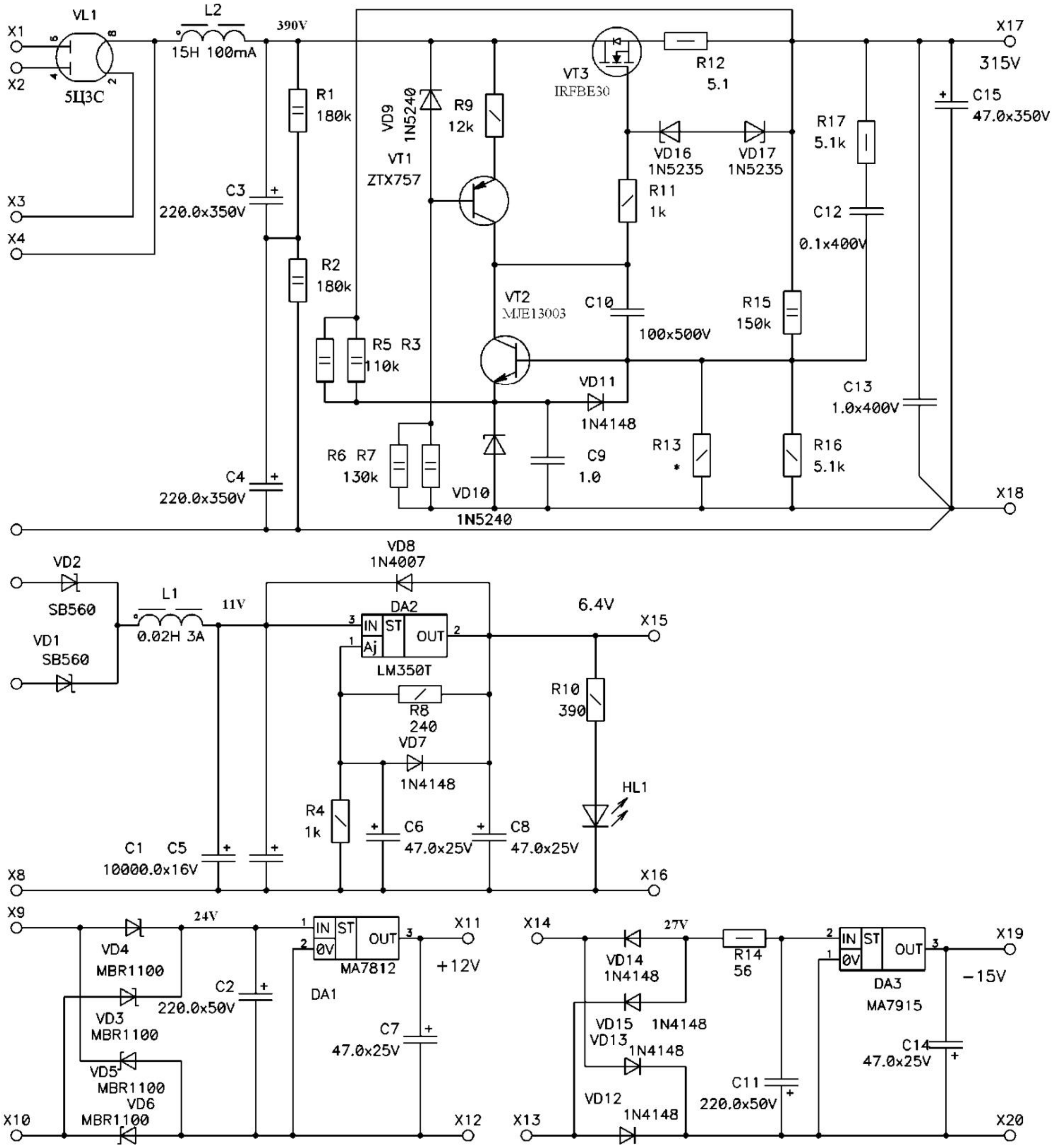

Figure 7

If you have the slightest doubt about the "pedigree" of this zener diode, then it is better to use zener diodes type KS191A.

Relays that directly switch low-level signals, type IM06GR (Tyco), an approximately equivalent replacement is G5V2 (Omron). There are no special requirements for the quality of the K4 relay.

Very stringent requirements are imposed on the output choke of the follower. The inductance of the inductor must be at least 15H, the self-capacitance of the winding - no more than 15pF, the equivalent capacitance of the inductor in the screen - no more than 100pF, the bias current - 25÷30mA.

The filter inductor of the anode source is also custom-made. But you can try to use a standard choke type D51-20-0.14 or gain the necessary inductance by turning on several throttles in series. The inductor of the filter of the glow source is D61V -0.02-3.

There is no winding data and design of the output choke and power transformer. special meaning. Both devices use custom cores. For the weekend throttle is used steel 3424 with a sheet thickness of 0.35mm, the coil has a deep vertical sectioning.

Once again I want to remind you that the lamps in the channels are selected in pairs, since there are no means There is no channel gain adjustment. When choosing lamps, special attention should be paid to the lamp 6ZH52P. For reasons that are still unclear to me, some instances of the lamps categorically refuse to work normally in such a circuit, although they work normally in the standard inclusion.

Setting

If everything is assembled correctly and the recommended components are used, the adjustment device is no problem.

1. Connect load equivalents to the source and check the output voltages, adjust the output voltages of the anode (R13) and filament (R4) voltage source. 2. Short circuit resistor R8. Short-circuit the input of the corrector. Set to middle position ki tuning resistors. Apply voltage to the corrector.
3. Set the output voltage of the channel anode voltage stabilizer (R38). 4. Set the operating mode of the second stage (R20) and the quiescent current of the output stage (R32). 5. Let the corrector work for 20 minutes and correct the modes. 6. Remove the jumper from the resistor R8. Measure the output impedance of the first stage. Solder an additional resistor bringing its output resistance to 3kÿ. 7. Let the corrector work for an hour, check the modes, correct if necessary

walkability.
8. Measure the actual characteristics of the corrector - gain, noise level, compliance with the frequency characteristics given.
9. Set the required input capacitance with jumpers. 10. Connect the corrector to the player and use a measuring plate to check end-to-end characteristic of a path. If necessary, adjust the value of the input corrector capacity.
11. Enjoy music.

Literature

1. E. V. Karpov, Network noise suppression, 2009.