Generator FY8300

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General impressions and a small upgrade.

In a sense, out of curiosity, well, and having the hope of simplifying your life by getting rid of the need to engage in plugging connectors, setting up and warming up older devices, this generator was purchased. I chose for a long time, with the study of the documentation, and came to the conclusion that in most cases, for a quick qualitative assessment of the parameters of an experimental device, its capabilities more than enough. This should not be taken as a complete impossibility to conduct more accurate measurement, you just need to take into account its features.

Since I was mainly interested in the frequency range up to 1 MHz, the lowest model with a maximum frequency of 10 MHz. Having received the device in hand (I would even say - a device, since he looks a little toy), I first checked all the parameters (closer attention was given to the frequency range of interest to me). To the credit of the manufacturer, everything fit into the application lazy characteristics.

A certain inconvenience was caused by a too small front panel and small buttons, the lack of anti-slip pads on the legs (the device is very light and strives to run away when the button is pressed). At first, it was embarrassing that the device did not show the actual voltage at the channel output, but the voltage that can be there if the channel is not loaded. There are no functions that would bring load, range and displacement to a common denominator in the device - you need to follow this on your own. As for the amount of jitter for a rectangular waveform, I did not have much hope.

In principle, everything suited me, it was possible to spit on something, take something into account, but to something just get used to. But another problem surfaced, which almost put an end to all my hopes - the device was noisy, noisy in the network, noisy in the air. Which didn't suit me at all.

The autopsy showed.

Naturally, I climbed to see what it was making such a noise there? Structurally, the device has two boards: the board of the generator itself and the power supply board. It was this impulsive source that aroused the main suspicions, which were subsequently confirmed. The generator is powered by three voltages - +5 volts and ±12 volts. Having measured the pre-consumed currents in the worst case (three channels are working, the maximum allowable load per channel is 10 MHz), I got - + 5V 0.73A, ± 12V 0.25A, then regular I replaced the source with linear laboratory sources, and the problem disappeared.

Along the way, it turned out that the fan performs decorative functions; when powered by 5 volts, it simply did not start, and that Chinese colleagues save on matches.

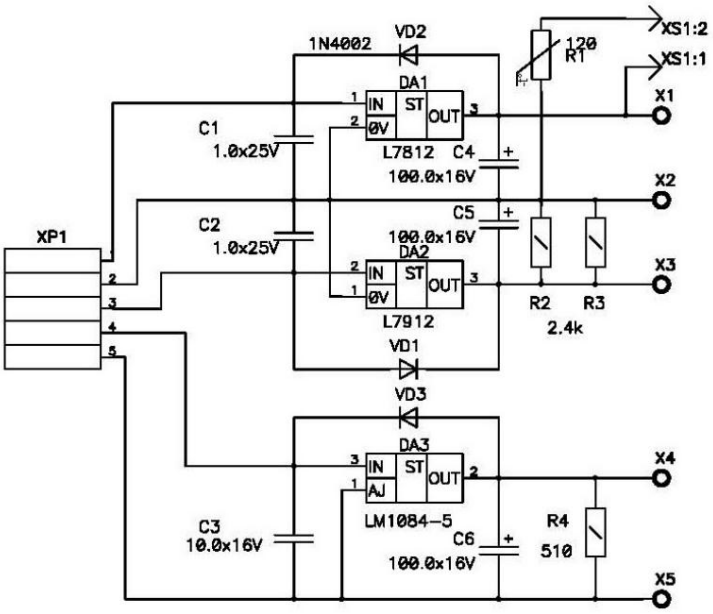
After evaluating the available space, I came to the conclusion that a linear source could be squeezed into this volume and along the way, correct the extra savings. A certain problem was the issue of placement of heat from water stabilizers. After preliminary calculations, it turned out that a plate with an area of about 150–200 cm2 can cope with this function (with the fan running) . The rear panel is all occupied and the only place where it could be placed was the top cover of the generator.

In general, I decided to try to crank out this adventure.

Source of power

To begin with, the terms of reference were formulated; with a set of voltages - everything is clear, with a certain margin, admissible currents were chosen - 5V 1A, ± 12V 0.4A. The device was supposed to work at a voltage networks within 200÷240 volts. To reduce the size of the transformer and reduce heat generation, where possible, elements with minimal voltage drops should be used.

Structurally, the source is divided into two parts - a block of rectifiers with a transformer, mounted on place of the standard source, and a block of stabilizers fixed directly on the heat sink plate. The circuit itself (Figures 1 and 2) does not have any features and does not require special explanations. For the 5V channel, I used an LDO regulator with a large current margin and a diode with a very low dropout.
voltage. But with higher-voltage channels: the devil beguiled, I decided for some reason that at such currents you can use standard three-pin stabilizers. In general, I decided in vain, for the positive channel, you must also use LDO (type LM1117), but the boards were made and mounted, so
what remains is what is indicated in the diagram (and cost an extra volt on the transformer winding).



Picture 1

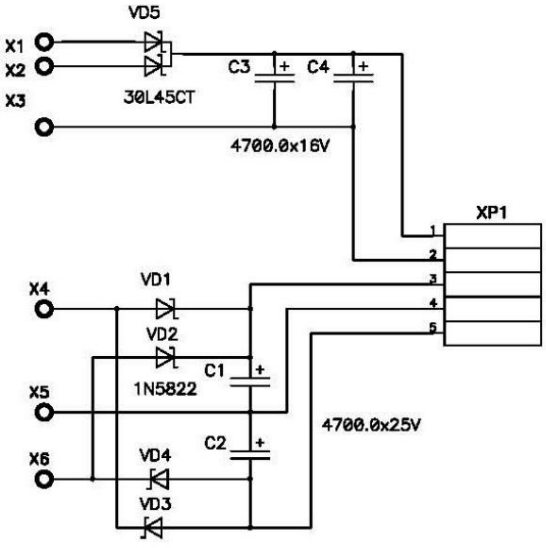


Figure 2

An additional fan connector is installed on the stabilizer board. Fan
it is powered from the +12 volt channel through a thermistor (used in computer power supplies), which has thermal contact with the cooler. The initial voltage on the fan is about 8 volts. The connector connecting the board (pitch - 3.96 mm) can be installed both on the rectifier board and on the stabilizer board. Wherever you feel more comfortable.

The regulator and rectifier boards are shown in Figures 3 and 4 on a 1:1 scale (the dimensions are worth checking). The rectifier board is made long, as it is also an element for fastening the transformer. Three supports are installed in the free space, to which the primary winding of the transformer and the fuse are connected. The position of the hole for the fixing screw of the transformer is specified locally.

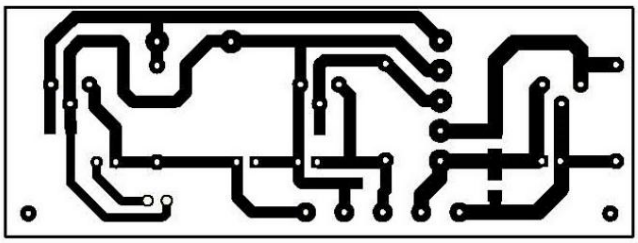


Figure 3

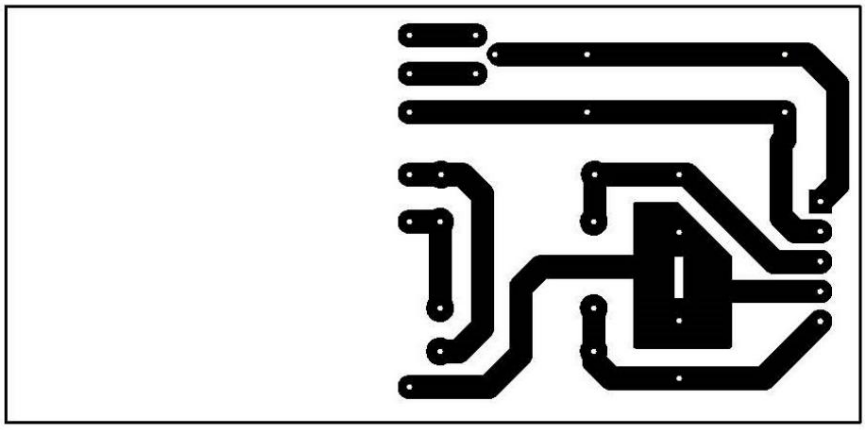


Figure 4

The boards are very simple and can be made by any amateur radio methods.

The placement of the components is shown in Figures 5 and 6, and Figure 7 is the markup for attaching the stabilizer board. In addition to fastening directly with microcircuits, 2 more racks 5mm high are used (if thermal pads are ceramic).

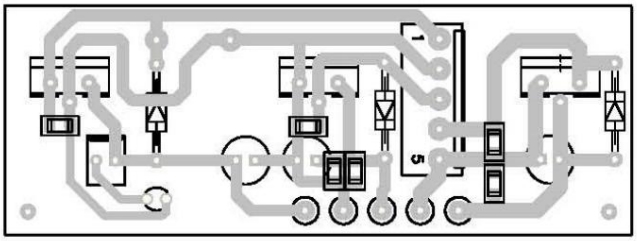


Figure 5

There are no special requirements for the components. The filter capacitances should work well in pulsed modes. Polymer tanks are installed at the outlet of the stabilizers. To be honest, I used what was at hand, of course, not at the expense of functionality.

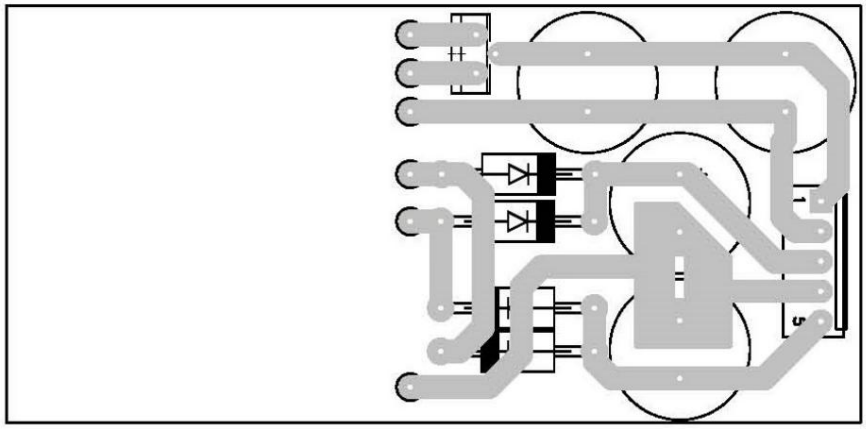


Figure 6

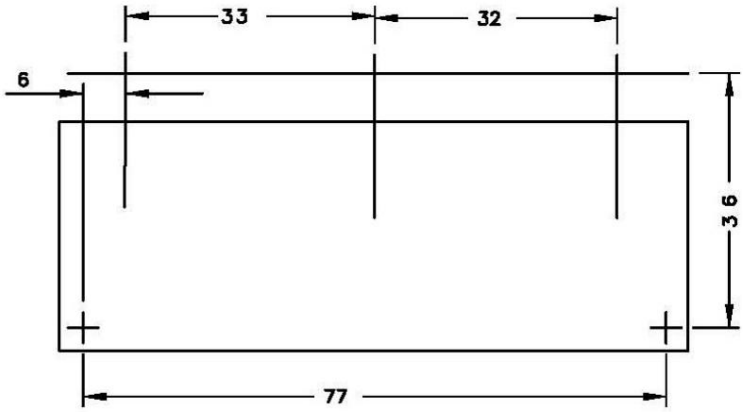


Figure 7

How it all looks assembled can be seen in Figures 8, 9.

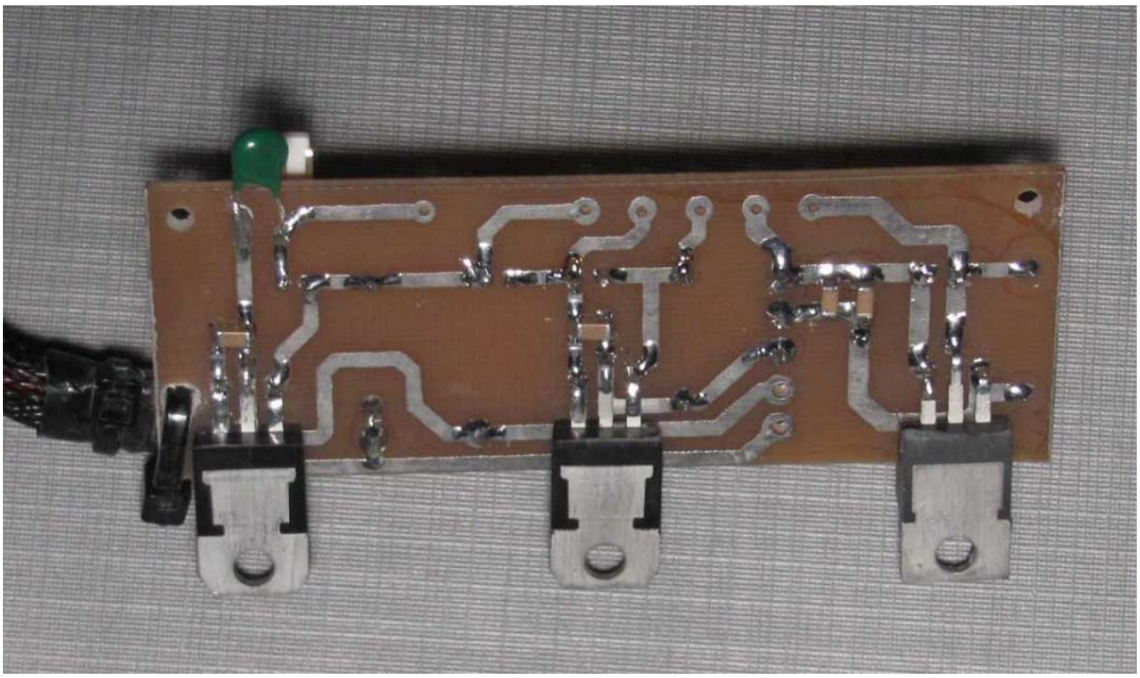


Figure 8

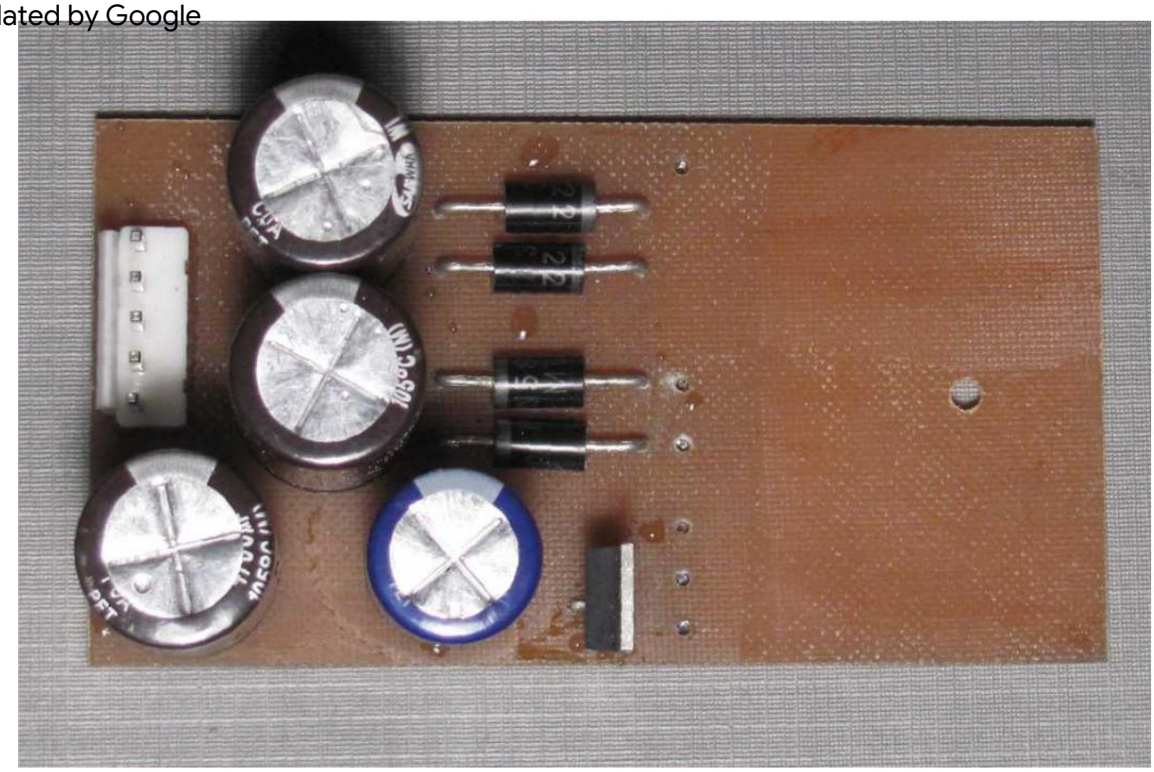


Figure 9

The transformer has two secondary windings tapped from the midpoint. For normal operation of the source in a given range of the network, the transformer must provide the following parameters: 8 + 8 volts
at a current of 1.2 amperes and 13.5 + 13.5 volts at a current of 0.8 amperes. These voltages must be at the rated mains voltage. The transformer is toroidal and made to order.

Naturally, before mounting the boards in the generator, they must be checked during operation for a nominal load and over the entire mains voltage range.

Generator disassembly

1. Remove the handle - turn it almost to the bottom cover and, stretching, remove it from the grooves. 2. Unscrew the self-tapping screw under the sticker on the bottom cover. It won't be needed later.
3. Remove the back panel. The panel is mounted on 4 latches located in the center of the top, bottom and sides of covers. In fact, the panel must be moved back. Immediately unsolder the wires to the network connector. 4.
Remove the front panel in the same way. 5.
Remove the top cover and disconnect the front panel connectors, unsolder the fan. 6. Disconnect the power supply connector from the generator board and remove the power supply itself. 7. Remove the generator board by unscrewing 5 self-tapping screws (one secures the heatsink of the output helmet chips Yes).

Cooling plate

A 4-5 mm thick duralumin plate is suitable for the cooler. I used a plate measuring 150x100mm. For beauty, but rather out of stupidity, a shelf was milled along the contour of the plate
6mm wide and 3mm deep. I decided for myself that the plate should be drowned in the hole in the lid. special
it did not add beauty, but added trouble. It makes more sense to extend the plate to the width of the body and simply put it on top. The stabilizer board is mounted on the plate so that the stabilizers themselves are
in the middle of the cooling surface. The plate is attached to the cover with 6 M2 countersunk screws. Stabilizer chips are attached in the same way, but with an M3 screw. All holes are drilled before the plate is installed on the cover (Figure 10). The stabilizer installation area must be sanded.

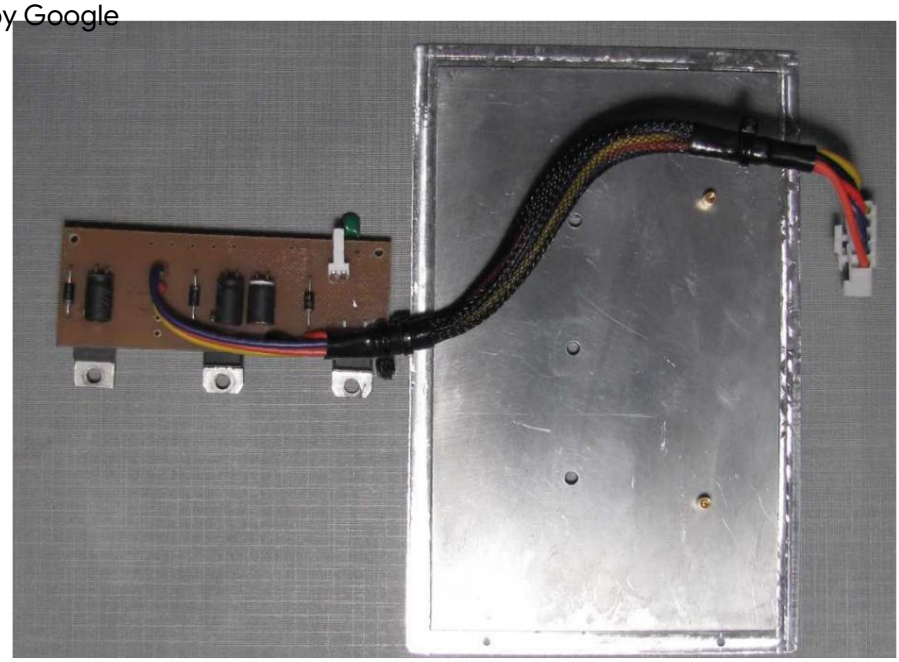


Figure 10

Top cover

A hole approximately 140x90mm in size is cut in the top cover. Its exact position depends on the dimensions of the plate. The rear edge of the cooler should be moved away from the edge of the cover by 15-20 mm so that the latch can be pressed. Naturally, the mounting holes on the plate should hit the body, and not be in the air (Figure 11).

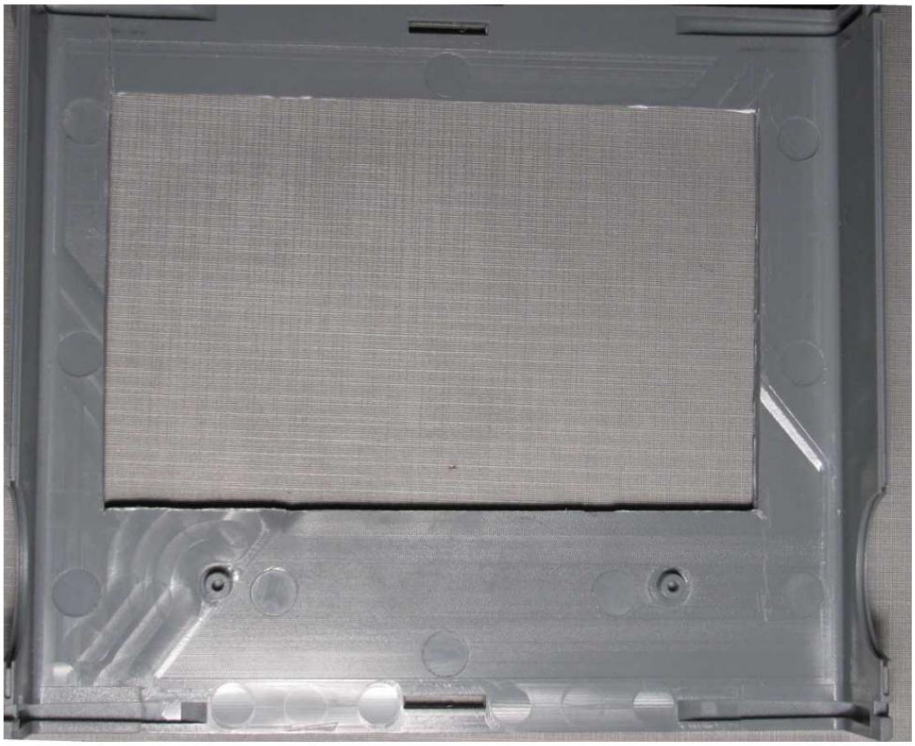


Figure 11

After that, the plate is placed on the cover, positioned, fixed with a clamp - and right through the plate is drilled with mounting holes in the cover. After that, you can attach the plate to the cover. The plate is fastened through a heat insulating spacer 0.5 mm thick (thin textolite or pressboard). It is advisable to use the same gaskets under the fixing nuts. After fixing the plate, everything together with the cover is painted in approximately the same color of the body.

In principle, with all these manipulations with the placement, it is advisable to do fittings so that nothing where it didn't fit.

Installing the stabilizer board

Before installing the stabilizer board, it is necessary to solder the wires connecting to the rectifier to it (if they were not soldered before) and to the generator. The length of the wires connected to the rectifier unit can then be specified locally. It is advisable to use a wire with a cross section of 0.5mm^2

The length of the regular wire connecting to the generator is enough if they are cut off right at the connector standard power supply. The purpose of each wire in the connector is written directly on the source board. Here you need to show maximum attention so as not to confuse anything. The negative wire connecting the 5 volt channel to the generator has been replaced with a wire with a large cross section. If +5 volts is supplied through two wires of the connector, then the negative wire with a cross section of 0.14mm^2 just looks awkward. For replacement well suited wire MGTF 0.35mm^2. It is desirable to somehow fix the generator power cable on stabilizer board (adhesive sealant, or hot melt adhesive). The assembled top cover, ready for installation, is shown in Figure 12.

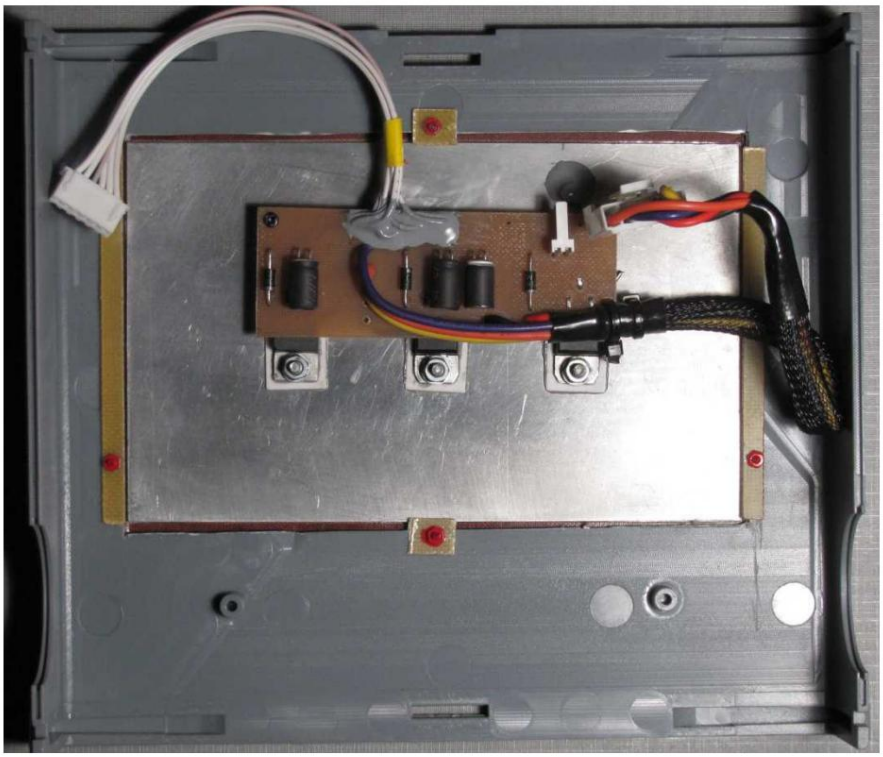


Figure 12

bottom cover

The following operations are performed with the bottom cover (Figure 13):

1. Remove the internal lintels on the side louvers. 2. Remove the two power supply mounting bosses. 3. Under the board, in the area of the output stage, a hole is cut with an area of 3-4 cm2 . hole for
   cover with a mesh, the mesh is fixed with glue or by fusing the edges into the body of the lid.
4. Mounting support for power transformer and rectifier unit is installed. To do this, the front and rear panels and the handle are temporarily placed, the assembled transformer with rectifiers is positioned in the housing. The transformer must not interfere with the installation of the handle and its rotation. Well
   the entire node should be approximately in the middle of the available space. After installing the support, you can finally fix this knot (Figure 16).

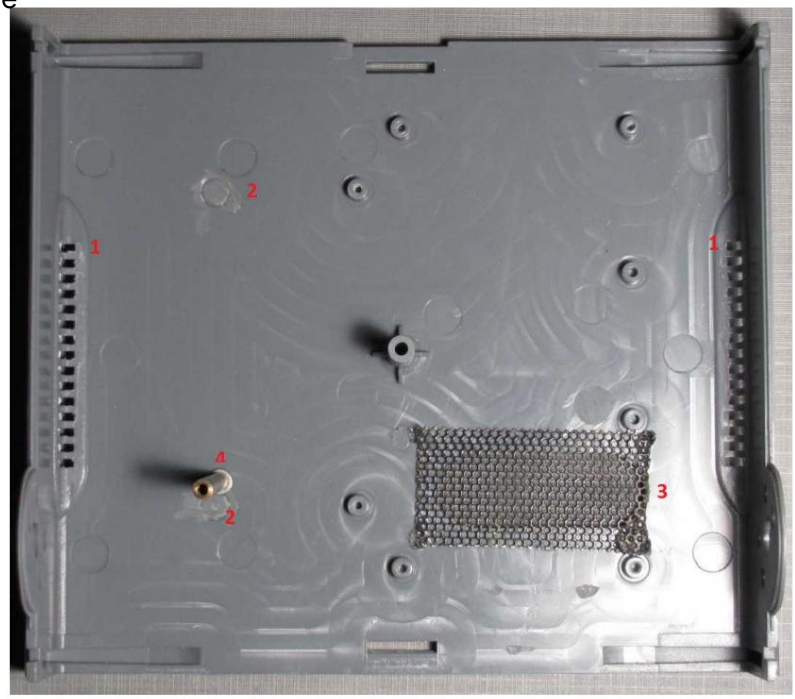


Figure 13

Back panel

The fan is removed, 4 holes with a diameter are drilled directly through the bosses of its fastening. 3.2mm, after which the bosses are cut off. The side on which the fan rested is removed, flush with the panel. The elements of the ventilation grille of the fan are removed, and the hole is enlarged to approximately the inner diameter of the fan shell. A hole is drilled above the USB port with a diameter of 6.5mm for a toggle switch with one closing pair of contacts. The toggle switch is used to switch the general generator wires with the "earth" wire of the network. This allows you to get a "floating" generator output. ra, which in some situations can significantly reduce the level of external noise.

The wires are immediately soldered to the toggle switch - one is connected to the "ground" contact of the network connector, the second is further soldered to the common wire of the channel ± 12 volts on the rectifier unit. One pole of the network connector is connected to the switch.

The fan and its protective grill are installed. Fan wires are extended and installed connector. I want to note right away that all wires suitable for the rear panel must have sufficient length so that during assembly the panel can be placed next to the body. What does it look like the prepared panel can be seen in Figures 14, 15.

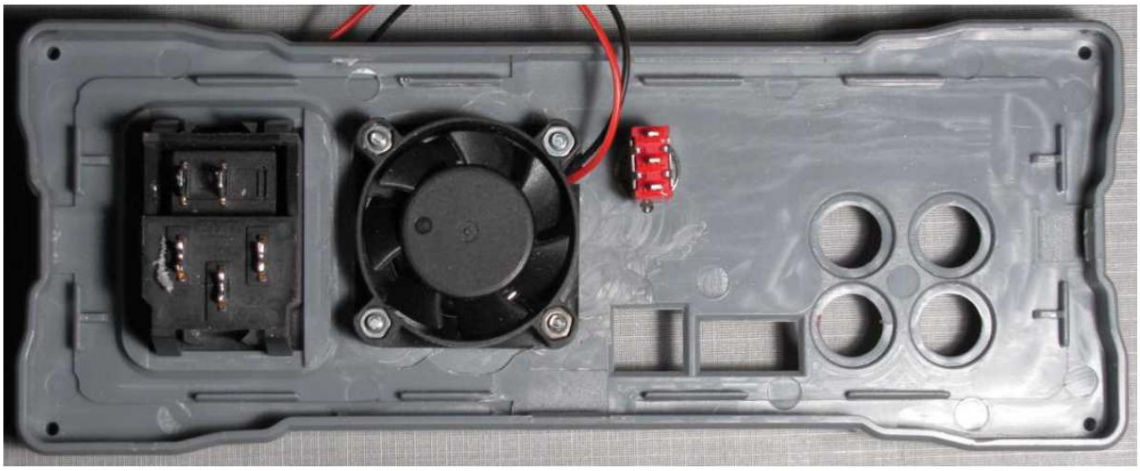


Figure 14

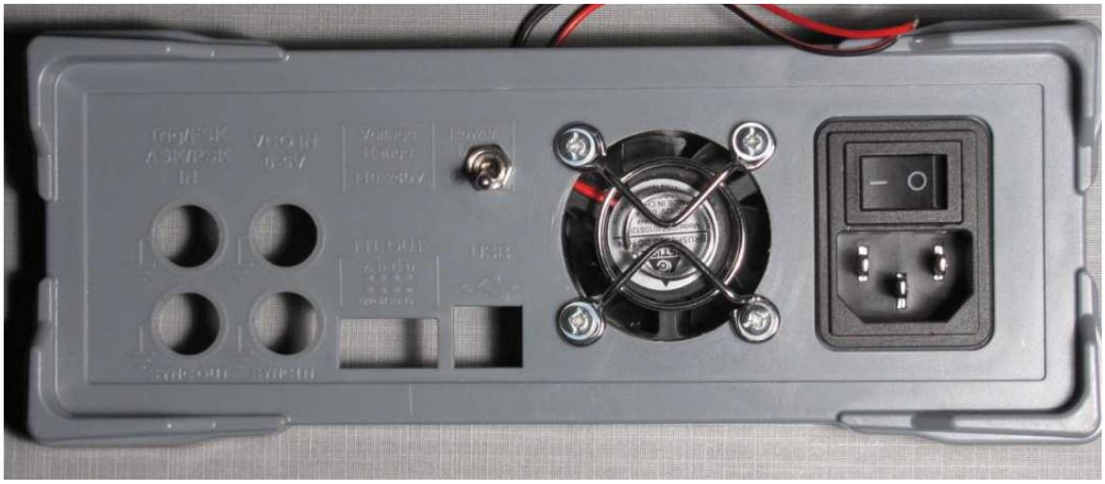


Figure 15

Pay

The first thing is that the board is carefully washed from the remnants of some terrible flux, I managed to remove with acetone. When washing, liquid should not get on the tuning resistors.

1. Install the output stage IC cooler. Apply heat transfer paste to the surface of the ICs before installation. The cooler is attached directly to the board with an M3 screw, so that the nut fits between the ribs, two edges need to be filed a little.
2. Glue the optional heat sink to the PLD with thermally conductive adhesive.
3. Replace the PLD power chip cooler with a wider one (was cut from the heatsink of the old video cards). When installing the cooler, use heat-conducting paste. To be honest, why there was a regular cooler, it is not clear, it touched the very edges of the stabilizer housings. Or it is not needed there at all, or for show.

Install the board on the bottom cover. The bottom cover prepared for assembly is shown in Figure 16.

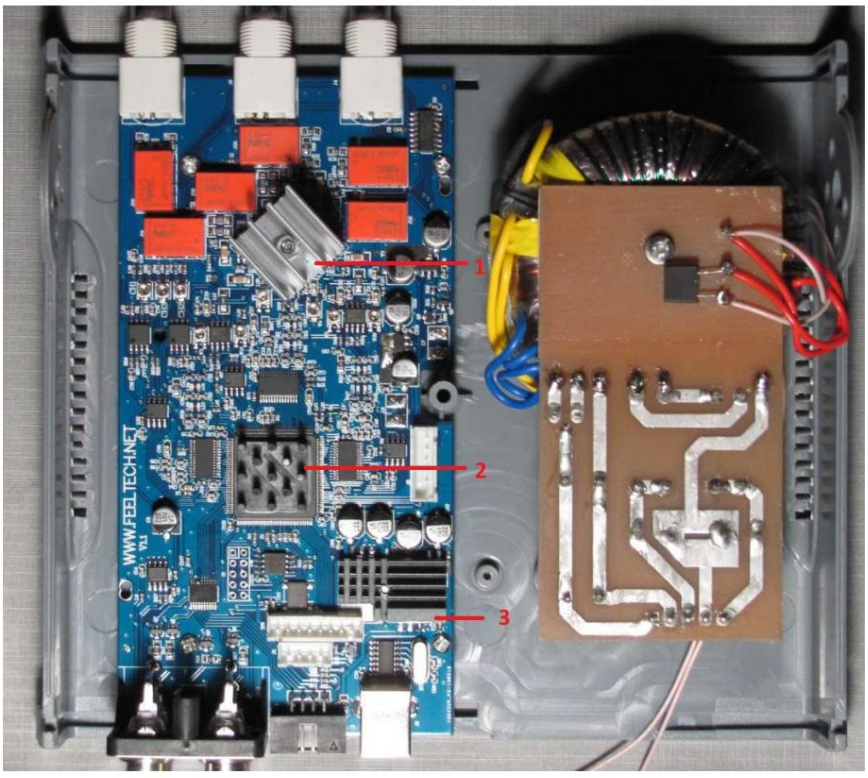


Figure 16

Solder the wires to the rear panel, connect the front panel, put on the top cover and connect the connectors of the rectifier unit and fan, snap the front and rear panels, install
handle. Turn on the device and enjoy the results of labor. How the assembled generator with a linear power supply looks like is shown in Figure 17.

Figure 17.

Conclusion

The total cost of rework does not exceed $ 20-25, and the most expensive part is the transformer. All the rest, often, can be found by rummaging through the boxes with trash, but in the end you get a completely “adult” and convenient device

In general, I am satisfied with the result, the problem with increased electromagnetic noise was completely resolved, along the way, the jitter of the front decreased (which indirectly indicates, let’s say diplomatically, the insufficient quality of the standard power source), the overheating temperature of the cooler above the medium does not exceed 8-10ºÿ in conditions of real work with the device.

