



Booster high-frequency accelerating station preamplifier protection system

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The reason for creating a system of protection by the starting frequency of the accelerating field was an accident at the preamplifier of the booster's RF station. It took a long time to fix and repair, so it was decided to develop a protective mechanism.

For efficient operation, the protection must provide a high frequency measurement speed, and a good response speed to the accident.

Causes of accidents on the preamplifier.



The main element of the preamplifier are field-effect transistors, which are the ones that fail.

In the absence of a field derivative, there is a current drop in the amplifier tubes, and further low voltage at the resonator. Comparing the high reference voltage and the low voltage on the resonator results in a high gain on the regulated amplifier and preamplifier. The high output voltage on the preamplifier transistors causes them to fail.

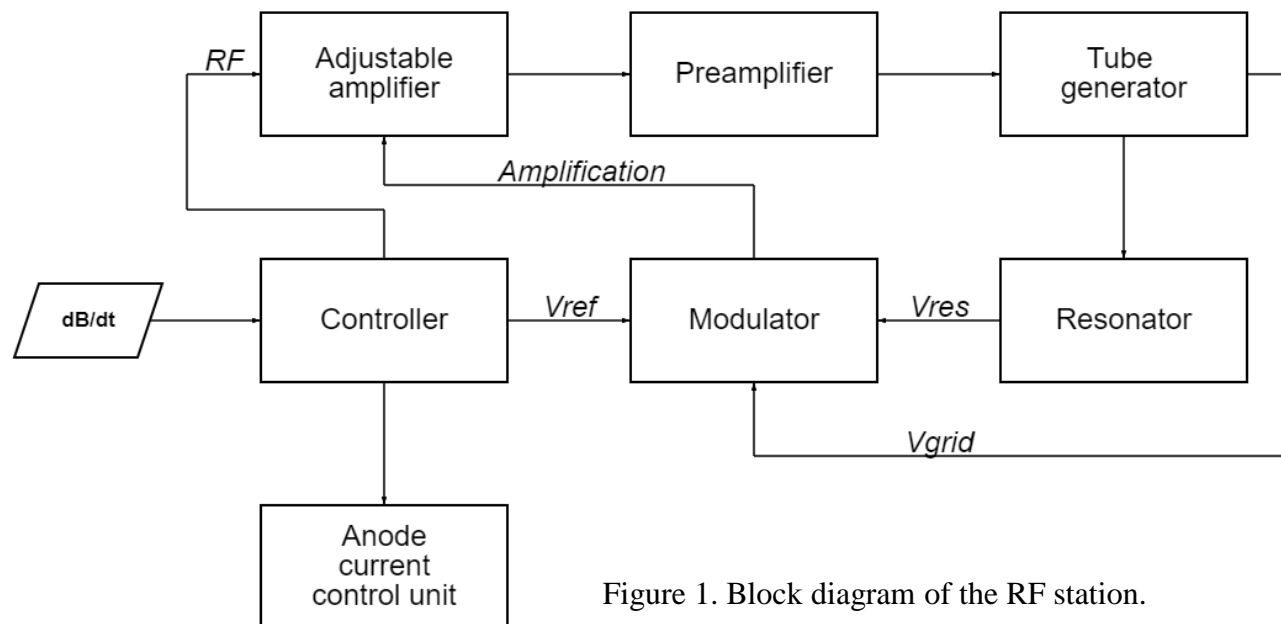


Figure 1. Block diagram of the RF station.



Figure 2. FET - IXZ2210N50L

Block diagram and exterior view.



Figure 3. Block diagram of the frequency protection.



Figure 4. Front Panel.

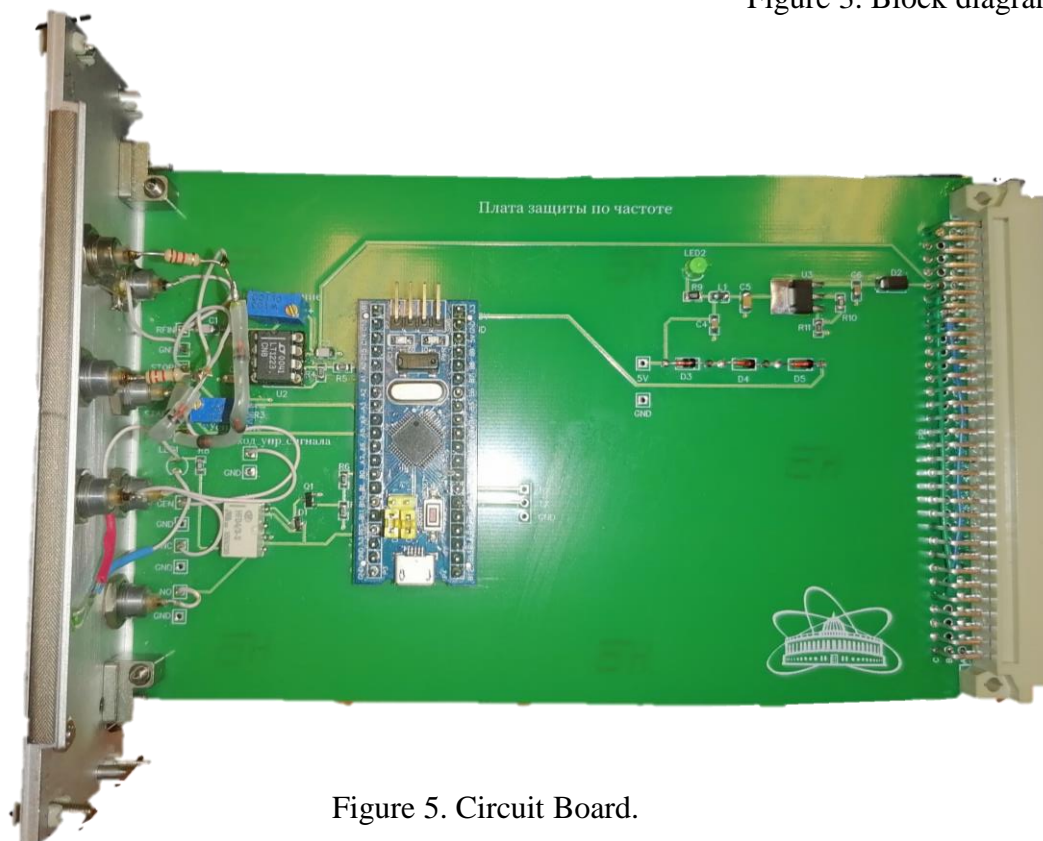


Figure 5. Circuit Board.

Block diagram and exterior view.



Figure 3. Block diagram of the frequency protection.



Figure 4. Front Panel.

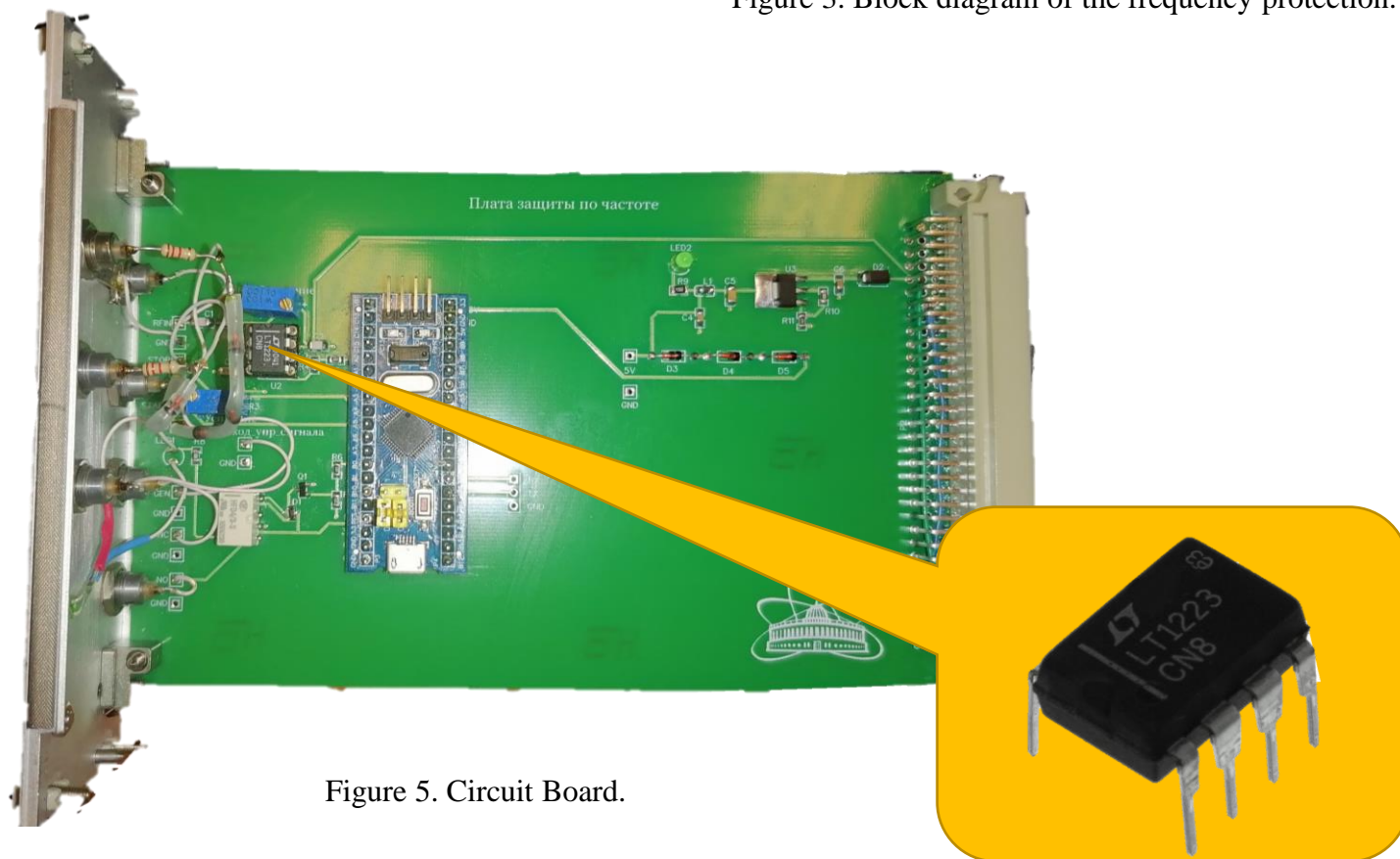
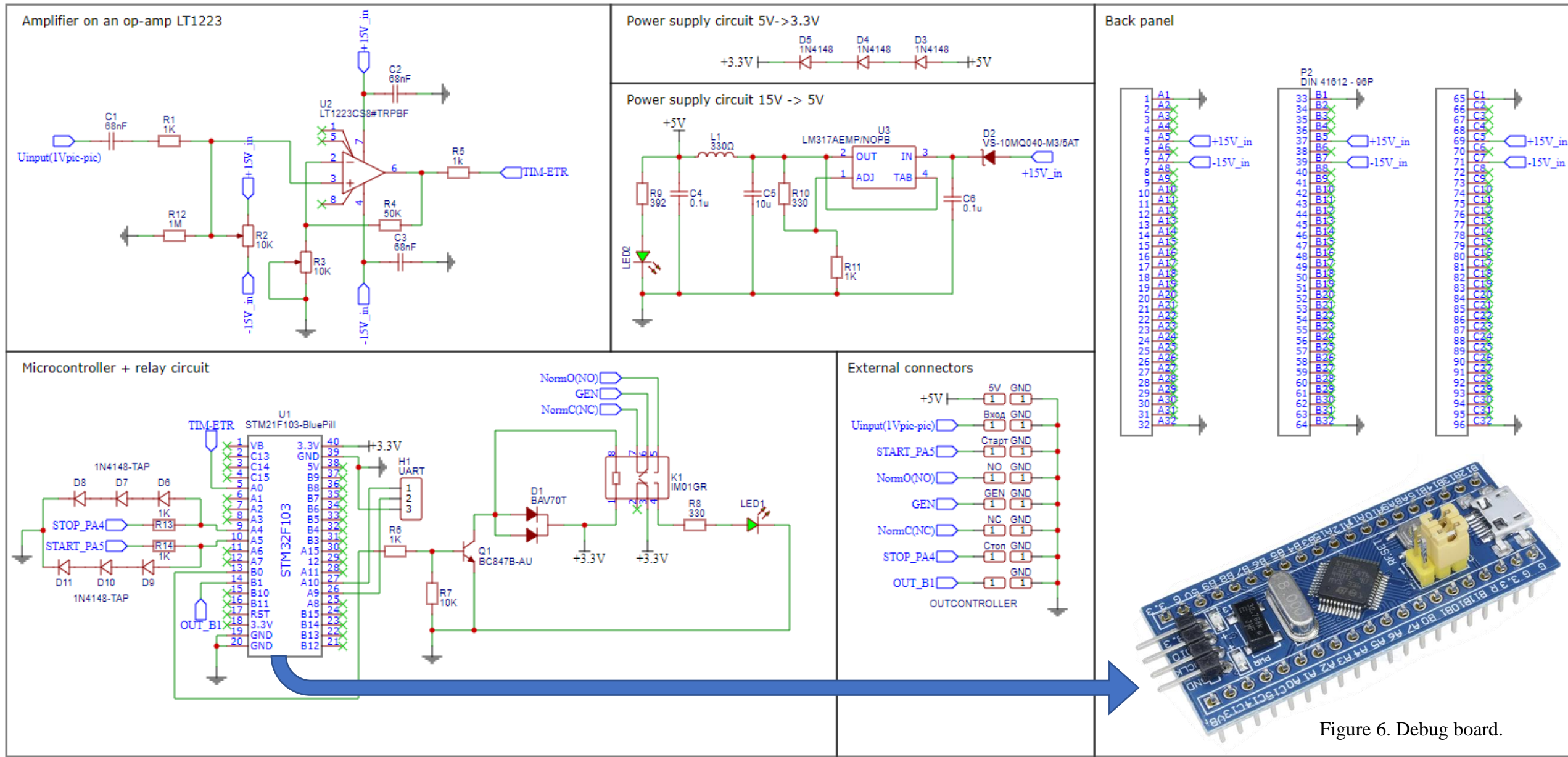


Figure 5. Circuit Board.

Frequency protection circuit diagram.



Testing. How does it work?



Figure 7. Oscillogram of an incorrect frequency.

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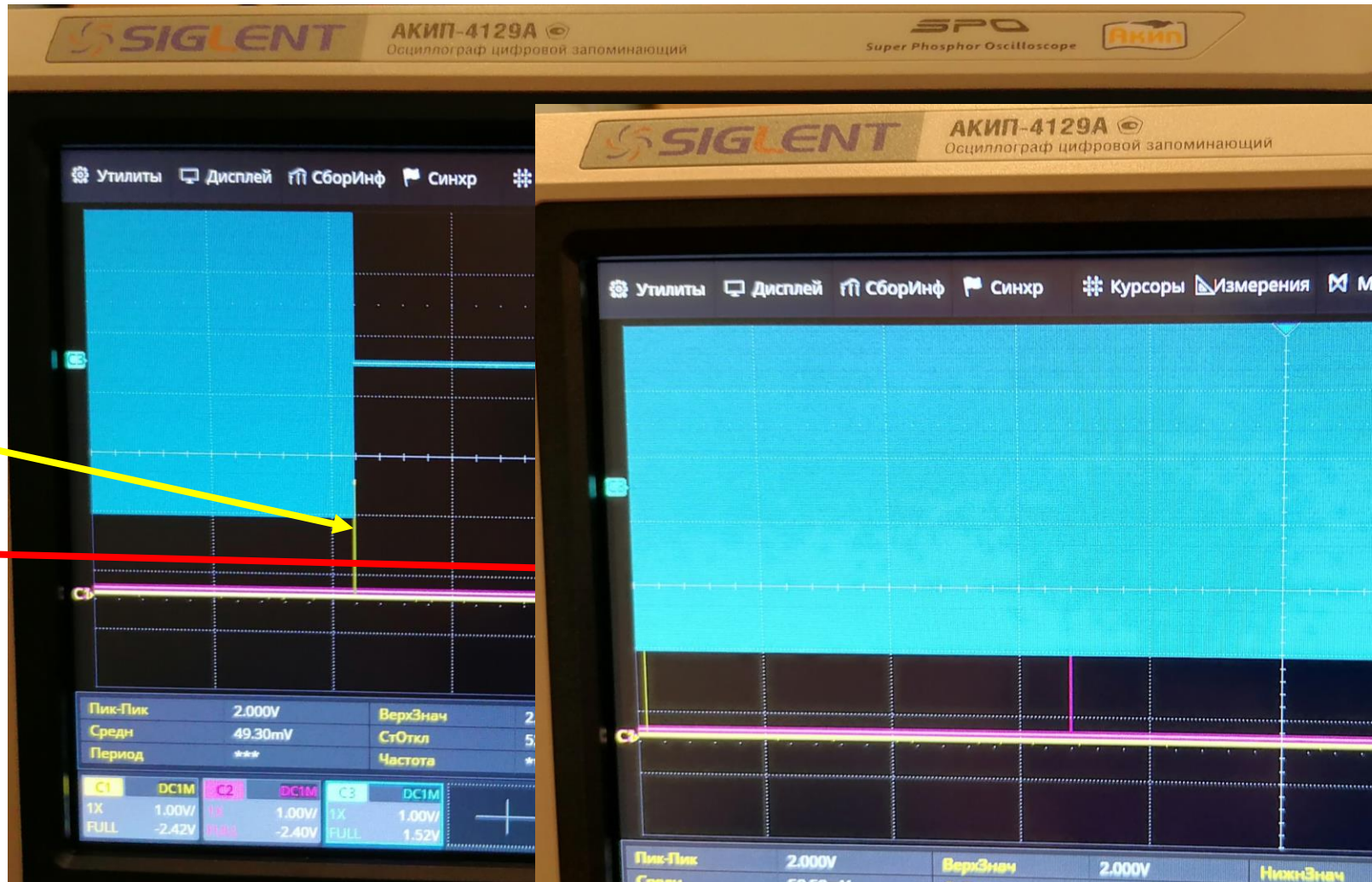


Figure 7. Oscillogram of an incorrect frequency.



Figure 8. Oscillogram of the correct frequency.

Test Results. Modulator relay.

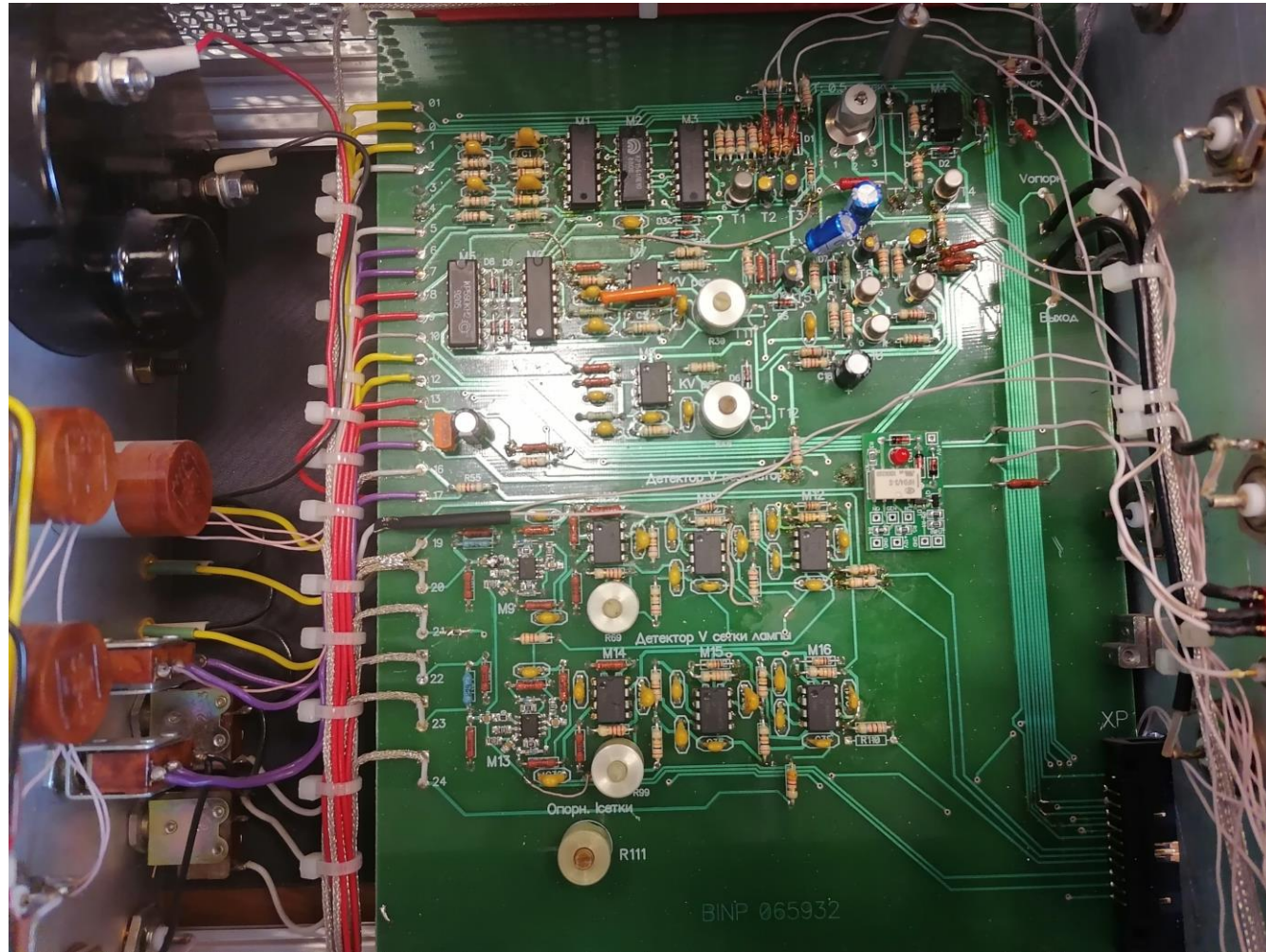
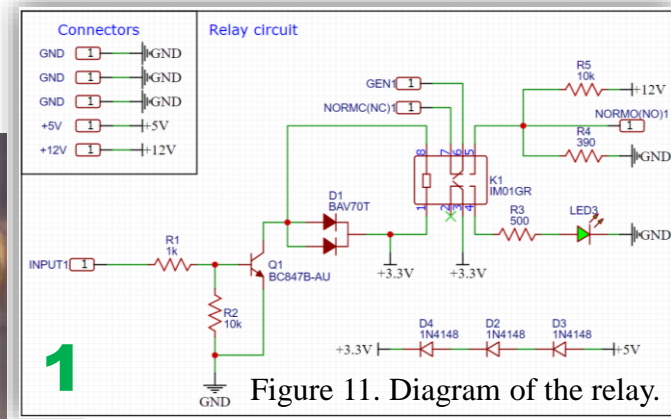
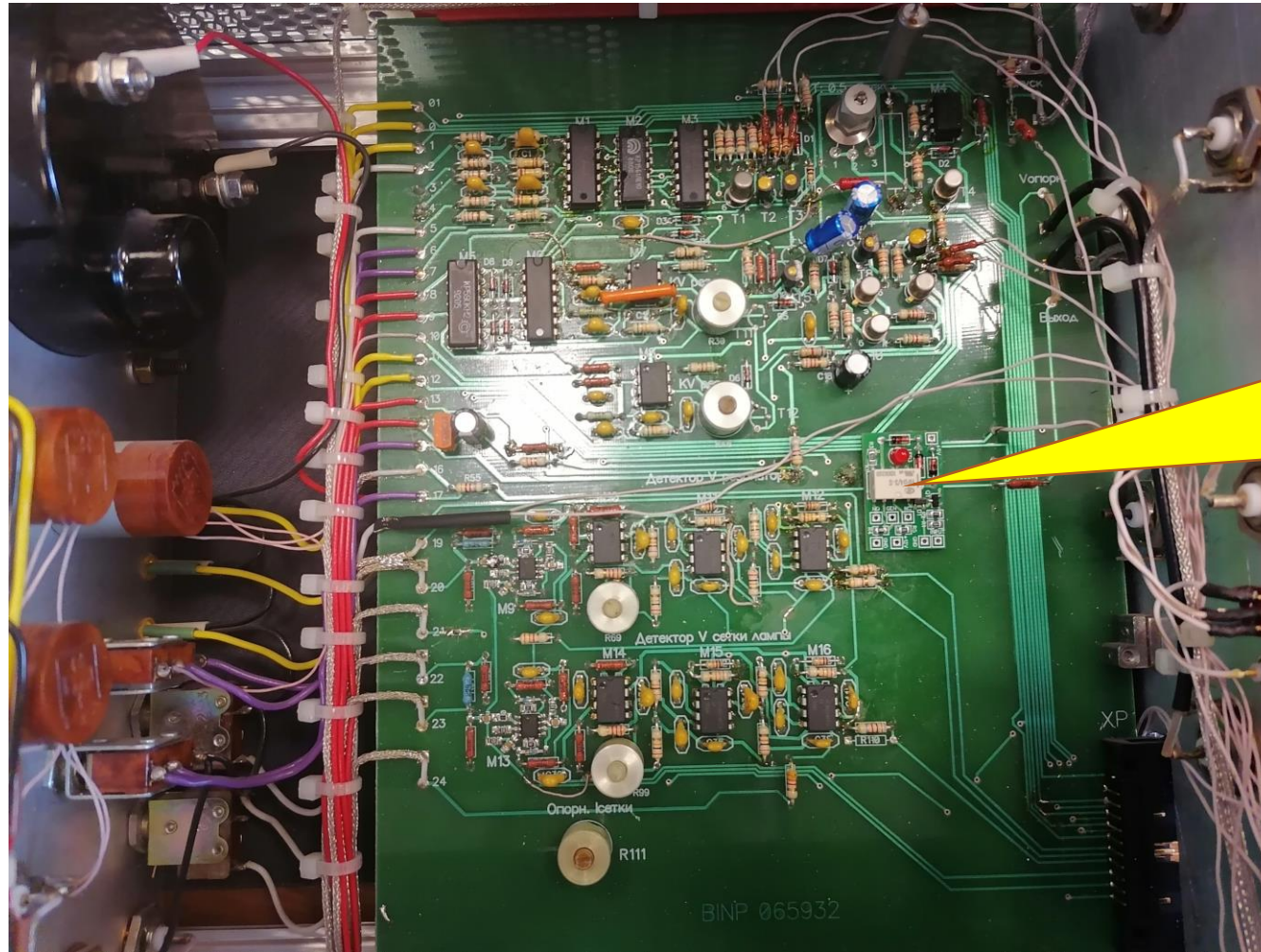


Figure 9. Front panel of the modulator..

Figure 10. Modulator top view.



Test Results. Modulator relay.



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Figure 11. Diagram of the relay.

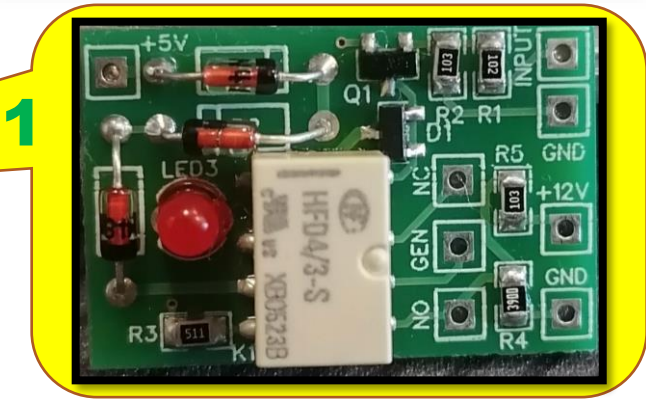


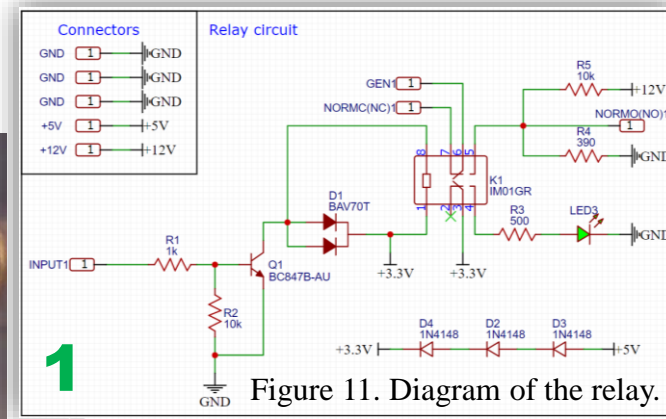
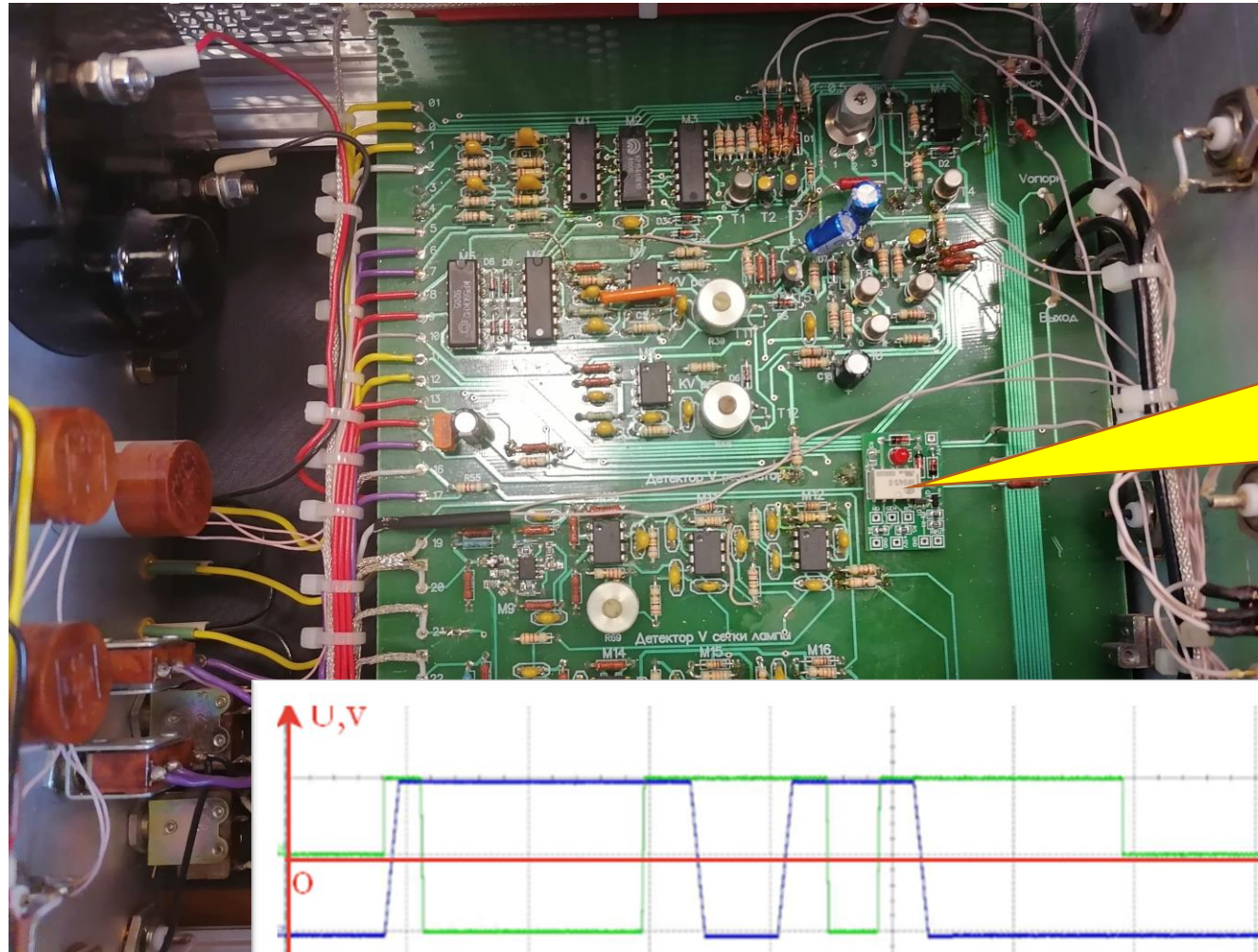
Figure 12. Modulator relay.

Figure 9. Front panel of the modulator..

Figure 10. Modulator top view.



Test Results. Modulator relay.



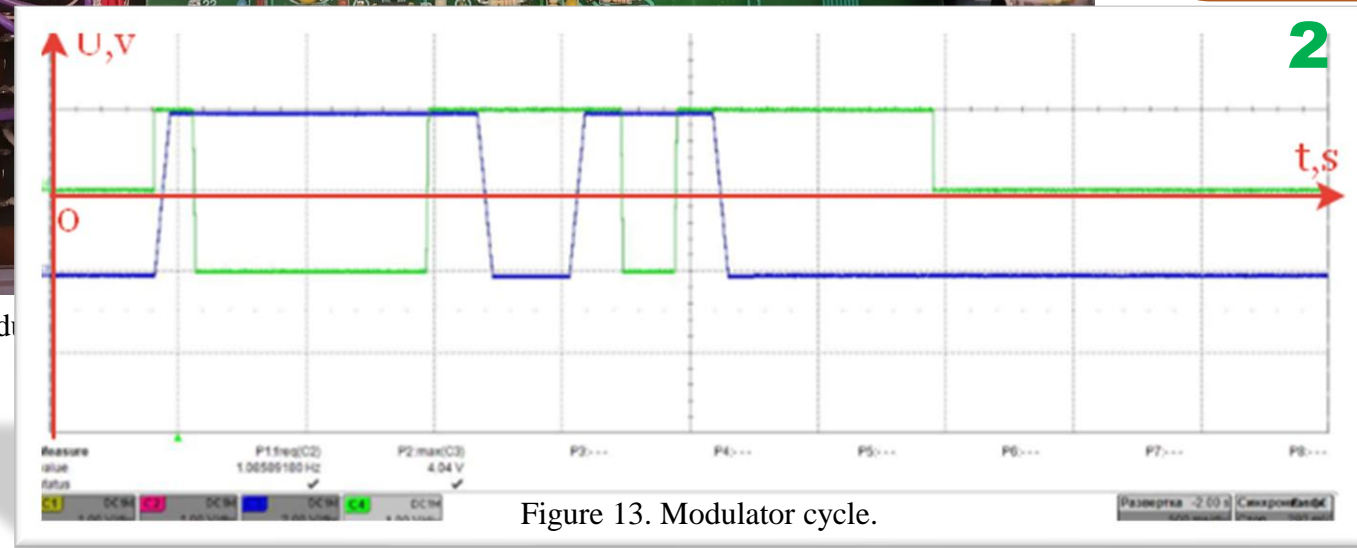
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Figure 11. Diagram of the relay.



1

Figure 12. Modulator relay.



2

Figure 13. Modulator cycle.



Voltage protection on the grid amplifier tube.



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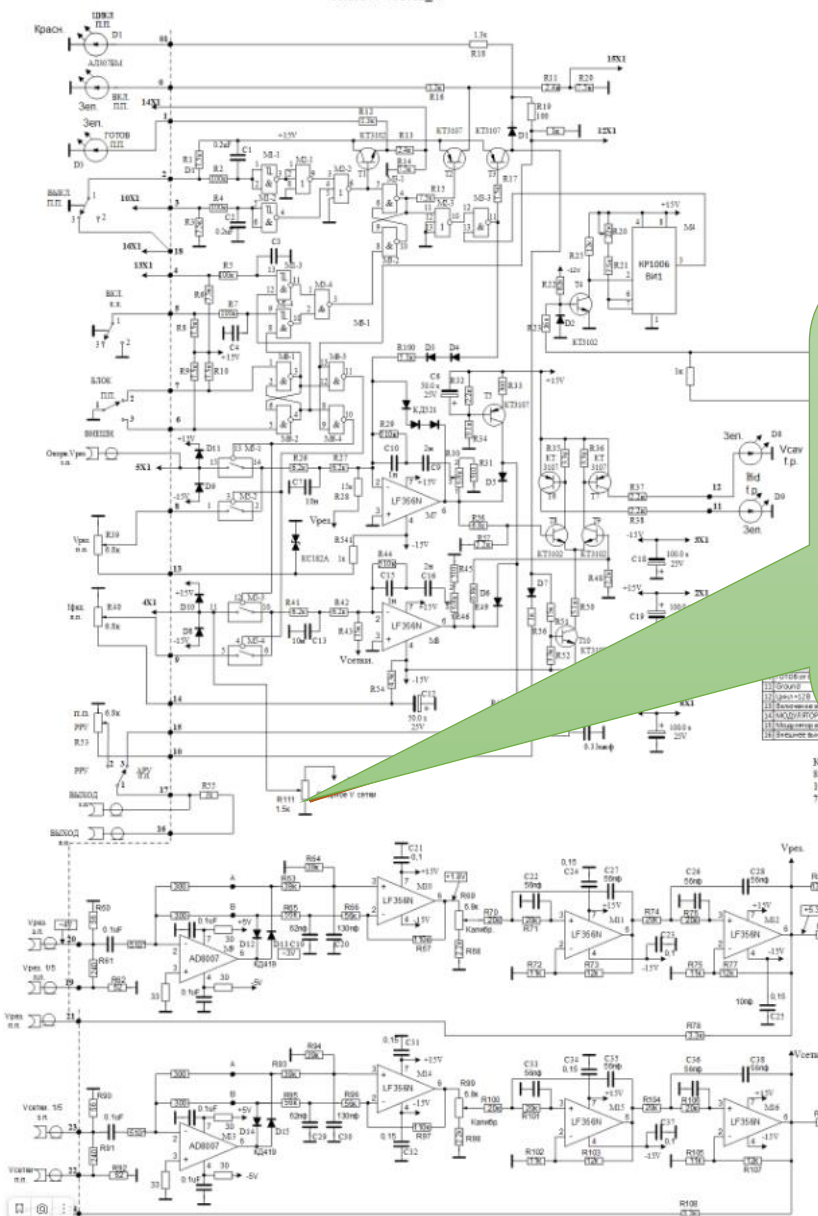


Figure 14. Modulator of the RF booster station.

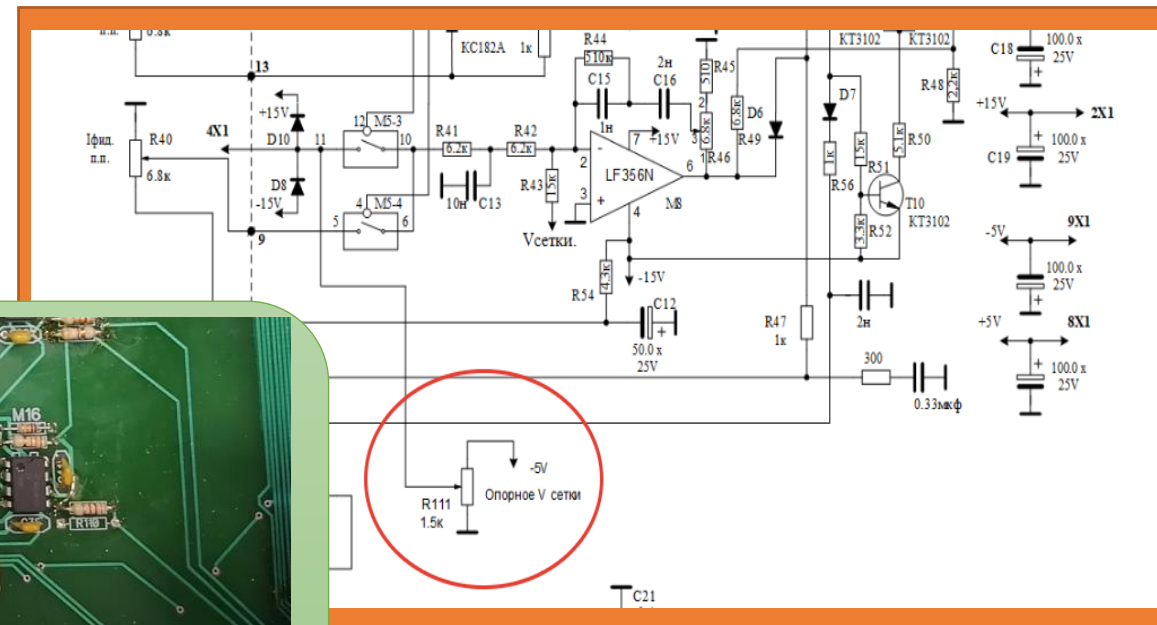


Figure 15. Part of the modulator circuit.



The results of the work done:

- The protection of expensive equipment in case of abnormal or emergency situations on two fronts has been improved.
- Further we plan to check physically on the installation in test mode, and then already to operate in accelerating sessions.



Thanks for your attention!

Questions for the speaker.