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# Automatic locomotive signalization control device application in auto blocking places in Uzbekistan railways

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**ABSTRACT:** This article is devoted to the traffic safety of trains through the use of automatic locomotive signaling control device, which is part of the automotive and telemechanics systems of railway transport, in auto-blocking sections. There are portable devices designed to check locomotive alarm signals in areas with autoblocking. A microprocessor-based digital decoder has been developed to transmit and receive data from a special communication laboratory car and locomotive cab, designed to detect errors in inspection and analysis. The device uses a special laboratory device to receive signals in parallel with the automatic locomotive signaling, as well as the operation of the device that transmits it to the receiving decoder located in a special communication laboratory car and how to transmit the received data. The convenience of special software written on the developed devices and its importance for railway transport are given.

**KEY WORDS:** Automatic locomotive signaling, decoder, wireless module, signaling and telecommunications, microcontroller, attenuator, converter, amplifier, frequency, converter, diode bridge.

## I. INTRODUCTION.

Currently, one of the urgent tasks is the safe and reliable management of train traffic at all railway stations owned by JSC "Uzbekistan Railways". By now, the total length of railways of "URW" JSC is 7504 kilometers. 38 percent of these total roads, i.e. 3016 kilometers, are equipped with modern automation and telemechanics, i.e. auto-blocking devices. It is difficult to say that these numbers are at the level of demand. The reason is that 75-80% of the public roads need to be equipped with modern equipment for safe and quick management of train traffic. Therefore, today, the management of "URW" JSC is carrying out the work of equipping many plots with self-locking devices at a rapid pace. Of course, it is not possible to develop every system 100% perfectly, the theory of probabilities has proved this calculation and the possible errors. In particular, this autoblocking system has advantages and disadvantages, as well as advantages and disadvantages of any system.

**Advantages:**

- Possibility of sending and receiving trains in block sections;
- Ability to monitor the condition of the rail along the entire road;
- Availability of controllable traffic lights;
- Coordination with the ALS system;
- It is possible to change the traffic light indicator to a red light when there is a danger to traffic;
- Availability of information on Peregon;
- Compatibility with modern systems.

Along with such advantages, it also has the following disadvantages.

**Disadvantages:**

- Signal transmission of protected connections to each other;
- Occurrence of false employment due to system errors in block plots;

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- High energy consumption;
- Expensive from an economic point of view;
- Inability to provide service to installed systems by organizations other than manufacturing enterprises;
- Emergence of false emptiness in block plots;
- Disadvantages such as differences between ALS traffic lights and passing traffic lights are encountered in these systems today.

## II. SIGNIFICANCE OF THE SYSTEM

If we look at the statistical analysis, from 2018 to 2022, the total errors (defect or fault code) made 14-15%, i.e., it was represented by cases where the indicators of the passing traffic light and the ALS traffic light did not match each other. Due to these errors, in most cases, there are problems in the movement of trains with the specified timetable. Among such problems, we will consider the origin of the problem of differences between the following ALS traffic lights and passing traffic lights and how to eliminate them. Theoretical and practical knowledge and skills are necessary for the study and scientific analysis of the above problem. In many cases, there are differences between crossing traffic lights and locomotive traffic lights, causing inconvenience for the driver and the train. The fact that trains arrive at their destination reliably, safely and on schedule and on time is an indication that the operating system and equipment are working properly and reliably. In railway transport, traffic lights are widely used to provide the driver with continuous information about the condition of the roads in order to control the trains reliably. [1]. The railway transport is distinguished by its ability to move regardless of the weather. But there are also problems in this transport system, such as the fact that the traffic lights are not visible in bad weather conditions, and the driver does not see or understand the signals clearly. As a result of these problems, the movement can cause various unpleasant situations if safety requirements are not met.

Of course, in such situations, the driver moves according to the command of the special traffic light repeater in the locomotive cabin [2]. But it is difficult to say that the received signals are always reliable. In such cases, it is necessary to analyze the signals transmitted to the rail circuit and the ALS traffic light. Usually, analyzes are carried out in scientific and practical laboratories. Therefore, the results of scientific research, experimental design and technological development are collected and analyzed in the scientific research laboratory "Automatics and Telemechanics" before applying them to the automation and telemechanics systems of "Uzbekistan Railways" JSC, "Signaling and Communication" Department, based on the sequence of each connection. Voltages and currents were measured and recorded using the "Tester" device. The frequencies transmitted from KPTSh devices and PCh 50/25 were measured and analyzed using a digital oscilloscope NM 14-50/54. The automatic locomotive alarm signal control device was tested in laboratory conditions. For this we needed the following devices.

- ✓ 220 volt variable voltage source;
- ✓ LOTR voltage reducing device;
- ✓ "Diode bridge" that converts alternating current into constant electric current;
- ✓ ALS filter;
- ✓ "FC 50/25 (frequency converter)" frequency generator;
- ✓ "PRT-A" type step-down transformer;
- ✓ "KPTSh-715" relay with code road transmitter;
- ✓ ALS amplifier;
- ✓ Oscillograph;
- ✓ Microcontroller;

## III. RESEARCH METHOD

In this laboratory process, we used a 220V alternating current source and obtained voltage from it in the following two directions, the voltage of 220V went to the "LOTR" device

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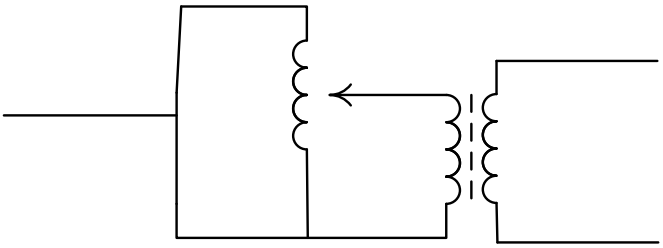

Figure 1. Scheme of Lotr device

A 45 volt alternating current was created by reducing the 220 volt alternating voltage to 45 volts through the lotr device. After that, in order to convert the alternating 45 volt voltage into a constant current, by a "Diode bridge"

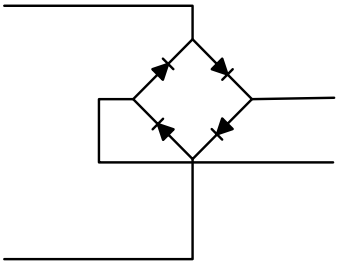

Figure 2. Diode bridge

alternating current converted to direct current.

At the same time, a constant current of 50V was generated, receiving the constant voltage from the diode bridge to the two inputs of the ALS amplifier, and the output voltage of 5V was directed to the microcontroller device. The other side of the wire from the 220V alternating current source is a frequency generator FC 50/25 (frequency converter)

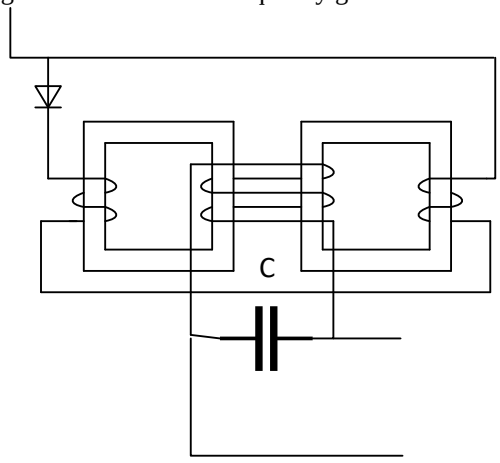


Figure 3. FC 50/25 (frequency converter) frequency generator:
c- capacitance

was connected to the device, when the voltage output from this device was checked several times by the tester, it showed indicators such as 134.5, 135.6, 135.9, 136, 134, etc. A voltage of 135V was selected as the closest and most accurate value to these results. When we step down this 135 V voltage using a step-down transformer "PRT-A", it shows

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0.7 V according to the result obtained through the tester. This received voltage of 0.7 V was given to the next code path transmitter relay "KPTSh-715" to generate the code.

When the output voltage from the KPTSh-715 device was checked by the tester device, the voltage drop was 0.8 V.

After that, the 0.8 v voltage from the KPTSh-715 device was fed to the ALS filter.

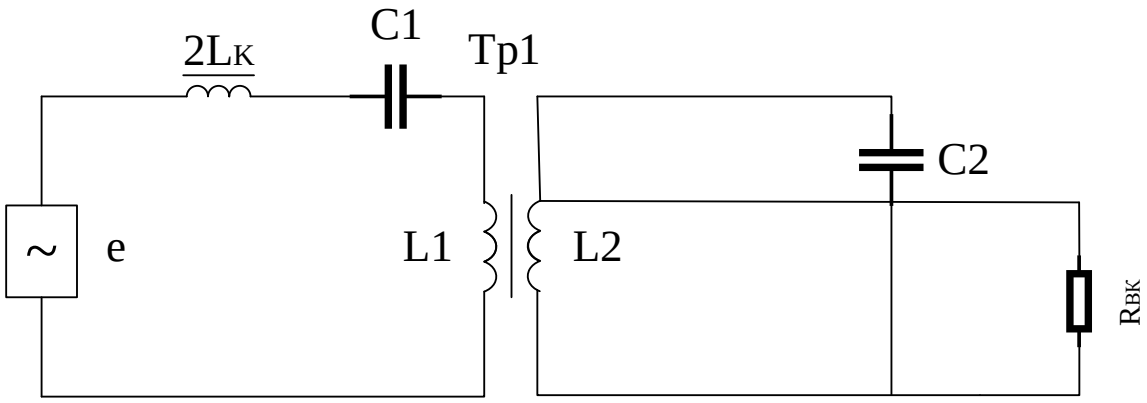


Figure 4. ALS filter:
Lk, L1, L2- inductance; C1, C2- capacitance; Rvk- resistance; e- generation; Tp1- period of oscillation

## III.RESULTS

This voltage is filtered through the ALS "Filter" and enters the third input of the amplifier. The signals from the amplifier are transmitted to the microcontroller device. The microcontroller receives the coded signals and transmits them to the microcontroller in the second receiving device through a certain channel, the received signals are checked by a special program on the computer, as well as parameters such as the time intervals of the signals, the time interval, etc., studies have shown that the red yellow RY generation code transmitter device needed 6 seconds to generate the code, and for the yellow Y code, the time interval was 5-7 seconds. The next research was carried out on the green G code. The green code impulse relay developed from generation code transmitter began to sense the code after 7-9 seconds. The change of the lights of the ALS traffic light according to the code signals generated by the device assembled in laboratory conditions was considered.

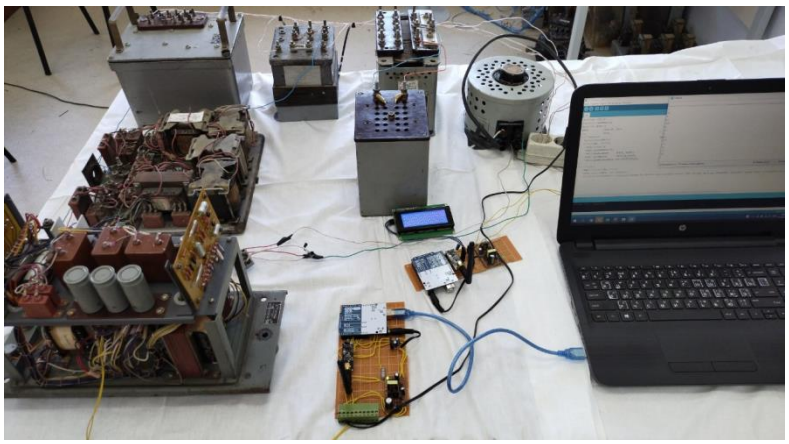

Figure 5. The appearance of the automatic locomotive signaling signal control device in the laboratory

As a result of the analyzes developed and carried out in the conditions of a scientific laboratory, the experimental test of this developed device was carried out in a parking lot equipped with an auto-locker, which is located in the Tashkent-New Chinoz area. For this purpose, one of the devices developed by connecting a special communication laboratory car to the passenger locomotive is connected to the spare output located on the BKR device #93214 of the

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passenger locomotive equipped with ALS to receive parallel information from the rail chain and the ALS traffic light. The data received by the receiving coils is connected to the collecting data box. As soon as the passenger locomotive starts to move, the transmission and reception device starts to generate signals, and the data from the ALS and the rail chain are received in parallel and transmitted to the reception device located in the special communication laboratory car. After starting the analysis of the obtained data, after passing 9 block sections, if the yellow Y signal was transmitted to the rail chain by the KPTSh device, the green G light was lit on the ALS traffic light, this situation was released to the data center and the large electromechanical department of the block section was immediately informed about this situation. It was emphasized that the automation and telemechanics devices in this block should be inspected.

For the rest of the time, no differences in signals were observed in the distance to the New- Chinoz station. As a result of scientific and practical studies, the method of ensuring traffic safety, which is important for railway transport, has been improved.

## IV. CONCLUSION

By localizing a special communication laboratory car through these developed devices, a solution was found to several important issues, such as the difference between ALS and rail chain signals in the block sections, as well as the working status of the automatic and telemechanics devices in the block sections. At the same time, the productivity of the employees of the "Signaling and Communication" Department will increase, which in turn will serve the practical achievements of "URW"JSC and the growth of the economy.

## REFERENCES

1. Pultyakov A.V., Skorobogatov M.E. System analysis of the stability of the operation of automatic locomotive signaling systems // Modern technologies. System analysis. Modeling. - No. 1 (57) - 2018. - P. 45-48.
2. Dmitriev V.V., Smirnov D.M. Device for monitoring the parameters of automatic locomotive signaling based on a modern smartphone // Automation in transport. - No. 4. - Volume 2. - 2016. - S. 45-48.
3. Kurbanov J., Xidirov J. Automatic locomotive signaling parameters devices on the basis of microprocessor elements .. The scientific heritage (Budapest, Hungary) The journal is registered and published in Hungary The scientific heritage No 55 2020
4. https://www.railway.uz
5. Train traffic control systems on hauls: a textbook for high schools railway. transport: textbook. Part 2 / V.M. Lisenkov, P.F. Bestemyanov, V.B. Leushin, A.V. Lisenkov, A.E. Vanshin; ed. V.M. Lisenkov. - M .: GOU "Educational and methodological center for education in railway transport", 2009. - 324 p.