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PRACTICAL RECOMMENDATIONS FOR ALARM SYSTEMS

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The article focuses on the features of modern security systems that allow to increase the sensitivity and accuracy, reduce the likelihood of false positives, protect from unauthorized access.

A detailed examination of signaling systems used for the protection of residential and industrial facilities has allowed to define the key points that should be considered in the development of security systems. Recommendations are directed both to increase the probability of detecting unauthorized access to the protected perimeter, and the quality of the system as a whole.

Central modules of security systems should be placed in screens made of materials with high electrical conductivity (steel, copper, aluminum, brass) in the form of sheets having a thickness of at least 0.5 mm or grid with a mesh of not more than 4×4 mm to increase their protection from electromagnetic fields.

Infrared motion sensors have a wide acceptance angle, allowing to cover large areas of up to 15 m. The special filter lenses are recommended, for example, "wide angle" [1].

Due to the well-functioning of the algorithms of data processing by the CPU of the security system, errors are practically eliminated while reading data from the protected area, such as errors related to the violation of the protected area by pets. However, reading errors are inevitable, so it is advisable to connect one more motion sensor to compare the data. Combined motion detectors are very promising using several principles of operation, such as a combined digital sensor PARADOX 525D [2]. The presence of a combined sensor in the system leads to increasing functionality, avoiding false positives, increasing sensitivity and accuracy.

The analysis of the operating principle Reed Sensors - control opening and closing of doors – shows a number of its features:

- contact bounce that occurs with the variation of the magnetic field, thus resulting in the opening and closing of reed contacts dozens of times a second;
- low reliability due to the mechanical parts in a pair of contacts; in the initial moment of time a high current flows through the contact, there are current inrushes;
- in industrial areas where powerful working systems occur, there is often a powerful magnetic field, which causes a reed to switch NO or NC contacts leading to false positives.

It is recommended to upgrade the design of the reed switch: set appropriate screens to enhance the reed switch contacts, select materials with improved mechanical properties.

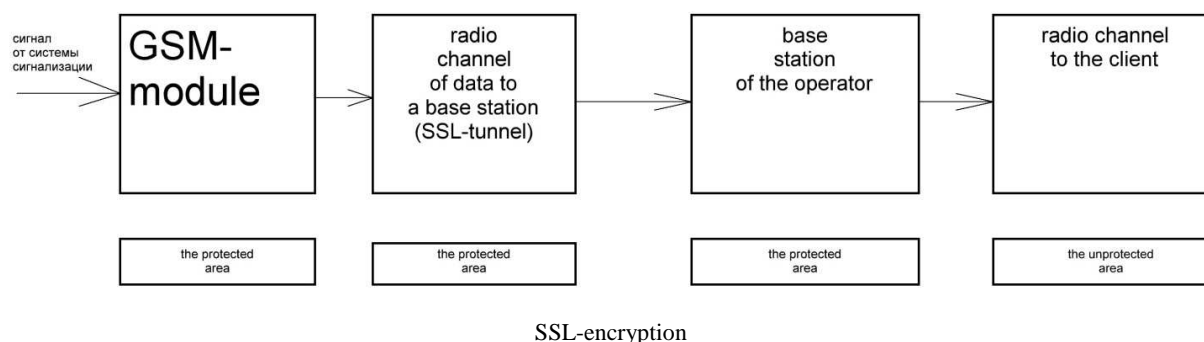
To improve the accuracy of the acoustic sensor (glass break), the algorithm for audio signal processing provides the analysis of two acoustic components - low and high frequency. The low-frequency component of the audio signal is formed at the moment of impact on the glass, and the high-frequency component is the result of its destruction - the sound of glass breaking. To reduce the likelihood of false positives in them special sound absorber (filter) should be installed, which will pass the audio signal related to the breaking of the glass, and all other signals must be faded out.

Let us consider the features of the security systems in large areas. The sensors included in the security complex, provides a tracking area of about 13-15 meters, but if there is a necessity to work in the wider area, there are a number of difficulties. A perimeter system should be introduced, such as an optical-electronic one, consisting of several receivers and transmitters of infrared radiation. The formation of an alarm occurs when there is an interruption of at least two light signals. There are sensors that can operate autonomously, independently of the central unit. For example, the sensor perimetric 2PH-100BQ [3] has a number of relay outputs that are connected to the inputs of the central unit relay protection.

An important component of any alarm system is an alert signaling channel. It is used to transmit the status of the system, sensor activation or the registration of the operation. A GSM-system signaling module is advisable to be included as well. However, GSM-modules, regardless of their advantages, have some drawbacks:

- active attacks (GSM-equipment can be targeted by equipment simulating the operation of base stations);
- the inability to determine the reliability of the data;
- weak encryption algorithms.

The local interface module and the GSM-data transmission to the base station cannot be considered protected. The most common method of increasing the protection is to use SSL-protocol - a cryptographic protocol that provides secure data transfer over the network. Certain SSL-tunnels are created, providing protection against attacks. Therefore, in the overall scheme of the data the number of unprotected sections is reduced (Fig.).



Only the communication channel from the base station to the client remains unprotected. SSL-encryption can be used in this channel, but it is necessary to contact your service provider to connect this option [4].

One of the very flexible functions of GSM-module is the management of the whole security system for GSM-channel. In this case, a bidirectional channel for transmitting and receiving information is formed.

GSM-modules J2ME are considered to be promising, using a powerful embedded platform designed for mobile devices, and security systems. Their advantages are as follows: high level of security and protection system in accordance with X.509 certificates; built-in debugging tools; high stability and absence of reboots; built-in perceptual difficulties code [4].

To realize such a platform the best solution is to use a portable PC devices - specialized mini-computers with high computing performance.

Conclusions:

- there are problems with the definition of the offender of the protected object because of their clothes materials, which absorb heat, or because of an extremely small distance from the motion sensor;
- complete protection of information transmission channels is currently not provided - the channel most vulnerable to unauthorized access are the ones from the base station to the customer; the use of SSL-encryption may allow to significantly reduce the likelihood of cracking;
- security systems should be placed in protective shields to ensure their sustainability to electromagnetic fields;
- the use of combined sensor increases the probability of intruder detection;
- perimeter systems consisting of multiple receivers and transmitters of infrared radiation allow quality control of large areas.

Further development of security systems is associated with remote access and management, the enhancement of functionality through improved algorithms for processing data from the sensors, the use of computing resources in the sensors ("smart sensors").

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ULTRASONIC FLAW DETECTION

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In this article the echo-method of ultrasonic flaw detection is considered. It describes the main reasons that contribute to the appearance of defects and gives practical recommendations for their detection and measurement of conventional size of defect.

During operation the rails arranged in a track are exposed to mechanical shock by the rolling wheel pairs, as well as climatic influences, which cause their wear and, consequently, the formation of internal defects. These