

DIGITAL RECORDING DEVICES IS ELEMENT OF SAFETY OF THE ROAD TRANSPORT

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Abstract

The duty of applying recorders in the road transport was implemented in states of the European Union on regulations (EWG) no. 3820 / 85 on harmonizations of some social welfare legislation referring to the transport, which was changing with regulation (EWG) no. 3821/85 on recorders applied in the road transport. The duty of implementation of the digital tachograph is also considered in the context of improving road safety. Through the analysis of the records of the registering devices can be defined in each specific case of speeding by more than the allowable value in the area. Technical requirements for your device recorded in the resolution, which defines the main parameters, are measured, among things other, the traversed path length of the car, speed, time driving, other periods of work, politeness of the driver and the correct operation of the check authorized for those authorities. At present led Regulation (EU) No 165/2014 of European Parliament establishing requirements concerning structure, checking, installation, use and repairs of tachographs and their building blocks is implementing the second generation of the digital tachographs connected with the device GNSS (Global Navigation Satellite System). Organizing the early detection from a distance is showing data officers from the digital tachograph and information concerning mass and mass falling on the wasp of the entire team of vehicles. Experience in work, economic pressures and competition in transport has led the drivers through a transport company in the event noncompliance, and in particular, in relation to the driving time and breaks. This article contains responsibilities after part rest on the drivers of vehicles takes the issues of system security and optimum performance of recording devices.

Keywords: *transport road, card driver, digital recorder, manipulations digital recorder*

1. Introduction

The duty of applying digital recorders in the road transport was implemented 1 May 2006 in all vehicles about the total permissible mass above 3.5 ton and buses about number of sites 9 including the driver. There were frequent infringements of drivers in order to implement the substantial change this way in analogue tachographs. As the switch or the pulse generator, he caused such devices that drivers could disturb the work of the tachograph and modify courses of vehicles and in the event of the lack of the idea for the possibility of manipulations it has often been finished with throwing away or becoming dilapidated record sheet. Implementing digital tachographs at first made it difficult for the manipulation the practice but frequent cases of the interference brought to the need to conduct continuous researches. These examinations also showed that different manners of the manipulation, which they indeed are using, existed in the road transport sector. That kind of action and attempts of the manipulation constitute the serious

threat to the safety road, exerting also inadmissible, adverse impact to the fair competition and working conditions of drivers. Thanks to better protecting the digital tachograph compared with his analogue equivalent even, very attempts of the manipulation of the system can more easily be detected what should act as a deterrent.

2. Structure of the digital recorder

Structure of the digital recorder (Fig. 1) with the appearance and the shape he resembles the car radio and is connected to DIN (Deutsche Industrie of Norms). The Tachograph has two readers of smart cards, the display, and the printer. Entries to readers are on an outside panel, printer writing out reports for the driver and test institutions (Police, Inspection Transport Road), display, on which important information is being shown among others about working hours and the approaching period of rest. Component parts of the device are carried out of materials about the sufficient permanence and the mechanical strength and stable electrical properties and magnetic. Any changes in component parts of the device or the kind of applied materials for their production, before leading into the production, should be submitted for approval by bodies, which types of the official prototype test of the device approved.

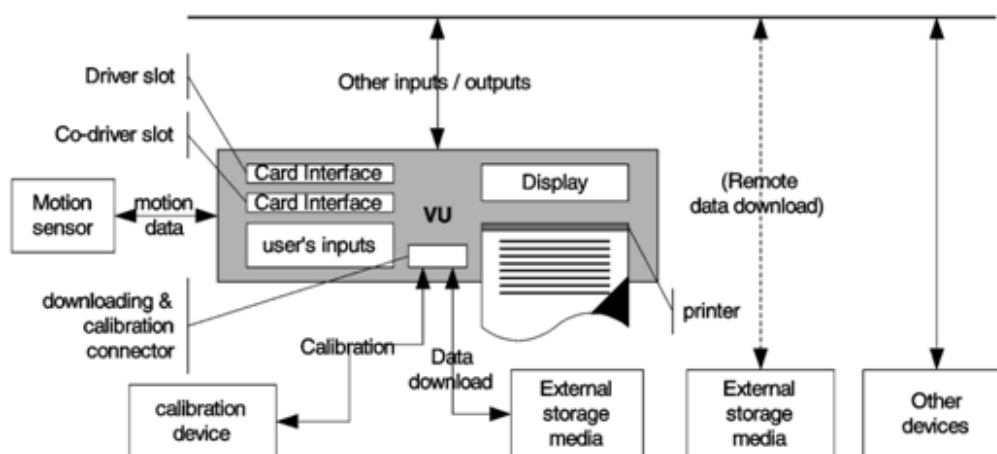


Fig. 1. Digital recorder

3. Cards of the digital recorder

Smart cards are integrating STC participants (System of Digital Tachographs) in all EU member states. STC participants, in relation to using cards to tachographs, were divided in four groups to which the following types of cards were assigned: for driver, test, workshop, and enterprises. Issuing cards by the member state is included with special procedure. The first card to tachographs, given to the petitioner, he has the card number equal of the sequence number, and the number of replacing and the number of refreshing are placed on "0". Numbers of all impersonal cards to tachographs, given to one review body, for one workshop or one transit company, they have the same 13 first digits and differ in further alphanumeric characters in the number. The system of cards moreover is secured with the cryptographic encryption what the maximum-security level provides. Cards consist of physical elements (bases of the card and the module – of the integrated circuit and ISO/IEC 7816 joints), and of programmable elements of operating systems (of SCOS and the applet Card 2.0 Java). Numbers of cards are staying broadcast by with the state agency (Polish Manufacturing Company of Securities) within 26 days of the submission of an application. According to the Art. of 16 sec. 3 Council Regulations No. 3821 / 85 on recorders applied in the road transport, the driver can continue the ride without the driver card in the maximum period of 15 calendar days or in the long period, if taking the vehicle to the base is

necessary, provided that he can prove the impossibility introducing or using the card during this period. It is worthwhile emphasizing that the driver has a duty to report the theft of the card to organs in this country, in which they made of theft, moreover in the recent time they observed that along with the exchange of the smart card an attention wasn't being returned during the control for the amendment of the last digit to the newly issued card (Fig. 2).



Fig. 2. Templates for Community cards to tachographs (the obverse and the order slip)

4. Safety of the digital tachograph – cryptography of smart cards

In securing smart cards of the digital tachograph a DES standard is used (Demonstration) and RSA (the name derives from the first letters of surnames of authors: Rivesta, Szamira and Adlemana). The standard symmetrical block cipher was created in the sixties of the twentieth century. In the more late time he was renamed to Lucifer (Lucifer) what constituted the specific play on words (English word “cipher” is denoting the code). The function of the encryption is accepting two types of the input: text open and fudge. The DES plaintext must be 64 bits, and fudge 56 bits. Processing the plaintext into the encrypted figure is covering three phases. In first a preliminary permutation which is moving bits is taking place, creating permute input. Second, the circuit is working of sixteen iterations of the same function, in which they are accessing functions permutation and placing. The result of the last iteration consists of 64 bits, constituting the function of the entrance plaintext and of the key. Left and the right side are staying exchanged,

creating the preliminary result. He is staying given to the permutation which is the reverse of the preliminary permutation. 64 is an outcome of this all action beat cipher text. The Diffie-Hellman algorithm securing the cryptographic public key system was changed after the discovery of Rivest, who developed a new system of public key system security. The Rivesta concept is based on a problem of the disintegration of substantial amounts to prime numbers. The public key is being generated by accumulating by oneself two large, randomly chosen first numbers. Next a next substantial amount is being chosen about determined properties, constitutes the encryption key. The public key is being created based on the encryption key and the recalled product of the first numbers. It is possible easily to calculate the private key, if the first numbers creating the product are known applied at creating fudge public. Such a security does not allow for the interference in the interior of the device, without simultaneous destroying all confidential data, stored in her interior.

5. Manipulations of the tachograph

Implementing digital tachographs only to a little extent made it difficult for the manipulation the practice. Frequent cases of the interference brought the manipulation to the need to conduct continuous researches above attempts towards the digital tachograph. These examinations also showed that different manners of the manipulation existed, of which indeed they are using in the road transport sector in order to cheat the tachograph, in particular the digital tachograph. That kind of action and attempts of the manipulation constitute the serious threat to the safety of the road traffic and individual participants, exerting also inadmissible, adverse impact to the fair competition and working conditions of drivers. Thanks to better protecting the digital tachograph compared with his analogue equivalent even, very attempts of the manipulation of the system can more easily be detected what should act as a deterrent. Against widespread opinions circulating in the environment of drivers, applying magnets, of switches, double pulsars and of other solutions of this type is not a practice not for the inspection. The detection of use cases of these devices and preventing using them constitute the continuous process, which requires the permanent commitment. Along with the technological progress, a number of the possibility of the interference in the system, and hence possible threats is increasing. Therefor the substantial role is falling to everyone for entities employed into ensuring the system security of the tachograph, in it for officers of inspection services, authorized for workshops and fitters and entrepreneurs observing the rules and drivers (Fig. 3).

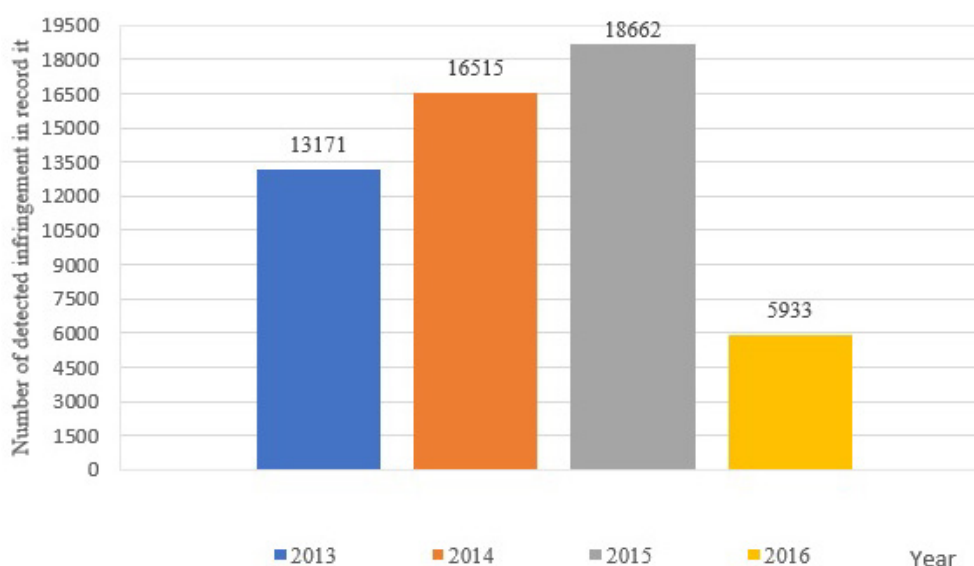


Fig. 3. Number of detected infringements in recorders

The organ of the Inspection of the road transport as the service appointed to inspections realizes assumptions, which are aimed at an improvement in the safety of the road traffic every year. The issue is well known to the manipulation of the digital tachograph from the beginning of activity but new ideas are exerting the pressure, for which examinations and the exchange of experiences are resulting with other international bodies (BAG – Bundesamt für Güterverkehr). At present, the service is set mainly to the issue concerning the arbitrary interference in the recorder and the undue use. Below data is showing results of road checks conducted by WITD (Provincial Inspectorates of the road transport).

Data contains the number and the type of detected infringements in recorders (Fig. 4).

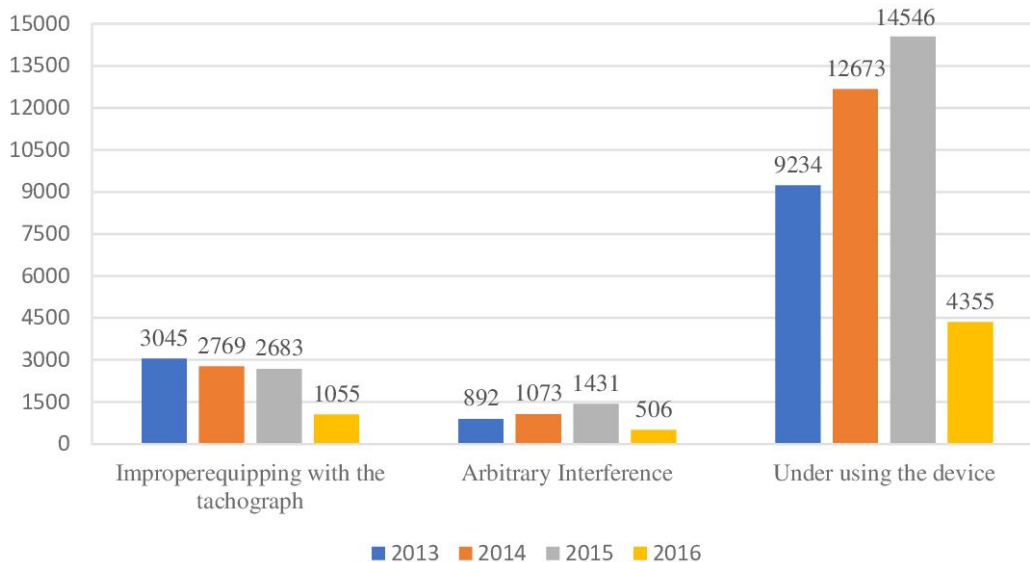


Fig. 4. Type of detected infringements recorders

Analysis is indicating the height of detected manipulations in the digital tachograph at the turn of four final years. The upturn is showing that the digital device is susceptible to retuning what is colliding with the fundamental assumptions among others road safeties. On the graph showing the type of detected infringements (Fig. 4) we are observing the fall in the issue of improper equipping and a sudden increase in undue using the device, in the main measuring cup caused with applying the not-approved type sheet or unintended for the given recorder.

The European Commission bearing in mind implemented the road safety including the following changes in provisions the regulation of the European Parliament and councils of the European Union) No. 165 / 2014 from 4 February 2014 on tachographs applied in the road transport, peculiarities his Art. 11 and the Art. of 12 sec. 7:

- the second generation of digital tachographs which include the connection with the GNSS device was implemented (global navigation satellite system), organizing the early detection from a distance and the interface to intelligent transport systems,
- organizing the early detection from a distance, should transmit data for the officer of a road check from the digital tachograph and information concerning mass and mass falling on the wasp of the entire team of vehicles (of the tractor and trailers or semitrailers), in addition one should apply norms of DSRC Prices which are being exploited for the purposes of electronic systems of the collection of fees, as well as in the destination of avoiding interferences between applications,
- new mechanisms of securities were implemented for the purposes of keeping the security level. Ones of such threats are lacking the expiry date of digital certificates. The life of normally used registering devices should amount to 15 years, counting from the day of issuing a certificate of the digital registering device. Recording devices should be exchanged after the end of this life.

6. Conclusions

Introducing an obligation of applying the digital tachograph in the road transport led falsifying or disrupting correct action to action at which they were aimed devices. In first years, few manipulations which were had tested were stated. At present, this problem is escalating particularly in the aspect of the not-approved type sheet. Drivers, which are manipulating recorders, are working to their disadvantage mainly. The problem could be terminated by the carrier, which should not have absolute trust in its drivers as well as for printouts from the tachograph. Whereas the carrier should realize how many, in reality, the driver needs the time for fulfilling the given transit order going in due course. The detectability of that practice still is growing and certainly will be growing. New provisions will cause tightening up the system of documenting the activity of drivers. Inspectors of the road transport participate in the sequence of specialist trainings in the scope.

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