TIMING FOR FIRE SPORT

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ABSTRACT

At our place fire sport is very popular among voluntary but even among professional firemen. During season there is a lot of competitions, however the most frequent is „fire attack“. In these competitions, the time is clocked in various ways. The oldest way is stop-watch clocking with several timekeepers. Later electronic timings began to be used. However these timings are not mobile enough and need an interconnection between devices placed at start and finish (target) by means of a cable. They also often need a power supply from network. Wireless fire timing is a device that should eliminate failings of current timing devices. This equipment uses a radio data transfer between starting and target device. The timing is supplied from accumulators, which provides its promptness and mobility. Another advantage is a possibility of transferring of gathered data to PC over USB port, where they can be saved or further processed.

1 INTRODUCTION

This device is designed for needs of fire sport, especially of the fire attack. Fire attack is a discipline of fire sport that is the most widely spread. Fire attack looks like that: the team prepares a „basement“, where the fire-engine, distributor, particular hoses and other gear are placed. Then the team prepares at the start and the attack is started with a starting-gun. Everyone has his specific task. The aim of the fire attack is to hit two targets placed 100 m from the starting line. After hitting targets the fire attack is finished. The scheme of the fire attack route is in the Fig. 1.

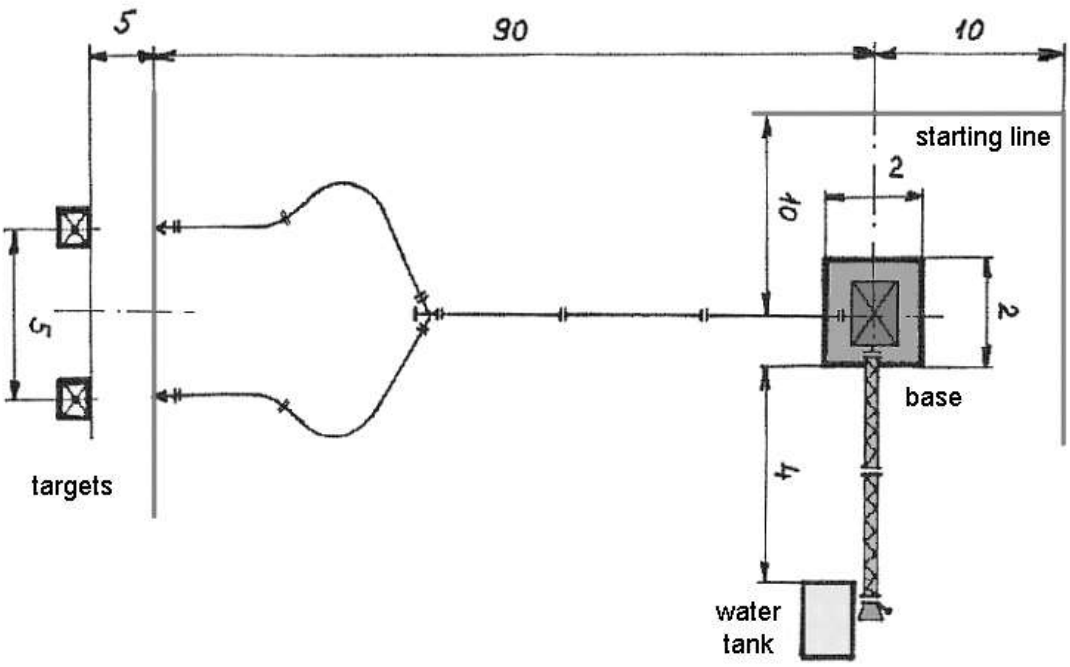

Fig. 1: Scheme of the fire attack route (distance is stated in meters)

2 ANALYSIS

This timing replaces currently used timings and eliminates their failures. The greatest improvement is an increase of mobility and promptness of the timekeeper. The original devices require lay of the cable between the space where the start is situated, and the finish targets, that, once hit, finish the time-keeping. Another restriction of mobility and promptness was caused by need of a power-supply. This device is divided into two main units which communicate by means of a radio transmission. The main unit is placed next to the start the second one is placed in finish next to the targets. In the Fig. 2 there is a scheme of the wireless fire timing.

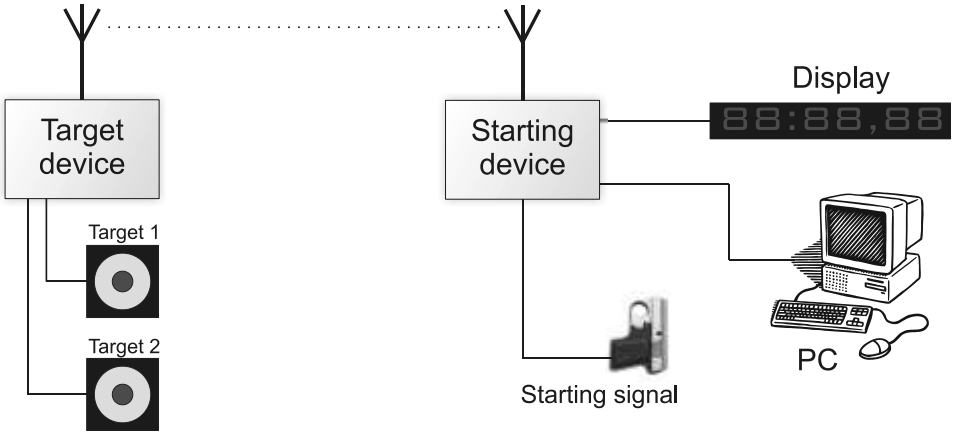

Fig. 2: Block scheme of the fire-timing

Both units are supplied with an accumulator, dimensioned to reliably provide energy during the whole time of the race. This solution significantly simplifies the installation of the timing during races and trainings.

Another improvement is the ability of gathering of obtained data. The data are always stored in the EEPROM memory; therefore they are safe even if the accumulator is discharged. They can be loaded to PC for further manipulation over the USB interface. The connected computer can overtake the timing for more comfortable control.

2.1 STARTING DEVICE

This device is placed next to the start. It is the main device of the wireless fire-timing. Due to this equipment the whole timing is controlled. Here the alphanumeric display (20 x 4 characters) is placed and it enables the operator to work in menu, set particular parameters, take a view of the team list, choose the team that is to get ready for the start, etc. In the Fig. 3 there is a block scheme of the starting device.

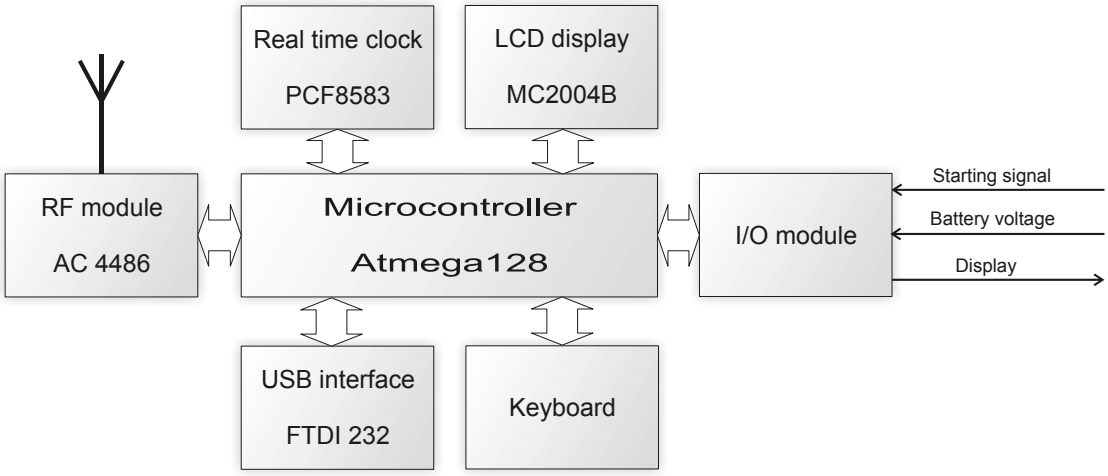

Fig. 3: Block scheme of the starting device

The basis of the starting device is a microcontroller ATmega128 [3]. Such a powerful microcontroller was chosen from several reasons:

- Need of two UART interfaces (one for the USB interface connection and another for the radio communication with the target device).
- Well big EEPROM memory for storing of gathered results (up to 140 teams).
- Well big data and program memory.

The most important circuit for the fire-timing is the real time clock PCF8583 circuit [5]. Here the time runs, independently on the microcontroller and other circuits. The microcontroller can load, process and save the present time at any time it needs. The circuit in the starting unit is power-supplied from a reserve battery that is recharged while the timing is in operation. Real time clock accuracy is one hundredth of a second, which is sufficient for firesport use.

Next component of the starting device is the AC4486 module [7] for a wireless data

transmitting. This module works in a license free frequency of 868 MHz. Due to this module the starting unit microcontroller communicates with the target unit microcontroller. The target device sends absolute values of time of hitting targets to the starting one. The starting device sends operating signals to the target one. Another wireless communication is a synchronization of the time of the target device real-time clock circuit with the starting one. It is necessary to add the time needed for data transmitting to the time from the real-time clock circuit. It is also necessary to send data in a specific moment of the transmit-frame to enable us to know the exact time of the transmission. The transmission time is known and equals 30 ms. This way we are able to synchronize times of both devices with fidelity of 1 ms.

2.2 TARGET DEVICE

This device is placed next to the finish targets. Its purpose is to record time of shooting the targets and send them to the starting device that analyses them. Another purpose is to inform computers about a successful hitting of the target with an acoustic and a beacon. In the Fig. 4 you can see a block scheme of the target device.

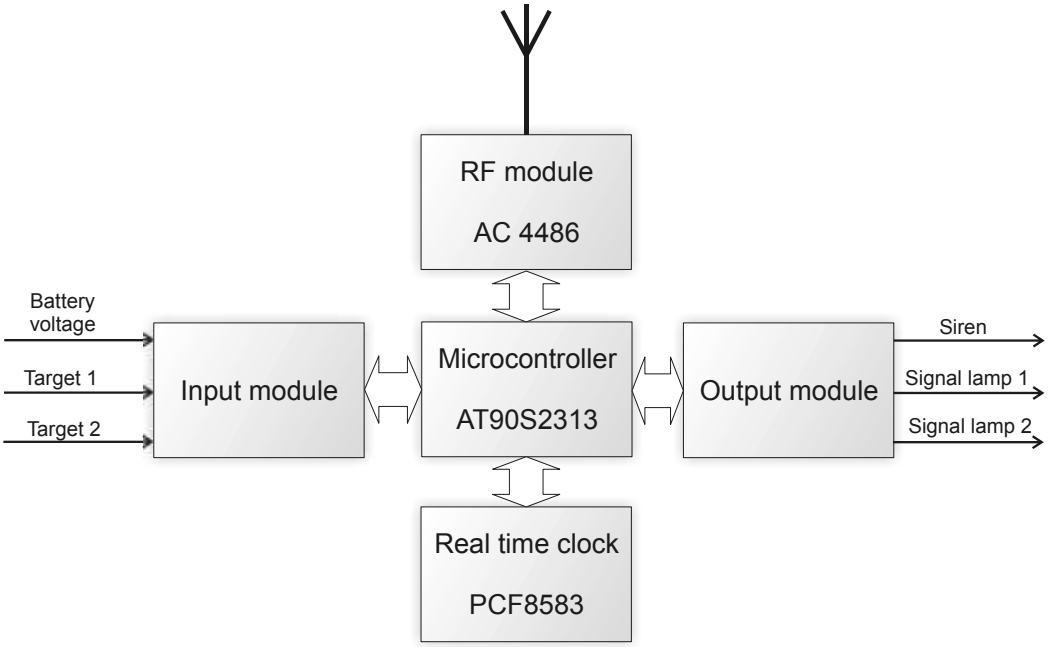

Fig. 4: Block scheme of the target device

The basis of the target device is a simple microcontroller AT90S2313 [2]. The real time clock is connected to this controller. Before each race this clock is synchronized with the starting unit. When the target is hit the microcontroller reads actual time and sends it (wirelessly) to the starting unit. The input and output module are used for a modification of the signal between the microcontroller and external devices.

3 CONCLUSION

This wireless fire-sport timing arose from a requirement of voluntary firemen. The device was already tested in the real competitions and there were no complaints about it.

ACKNOWLEDGEMENTS

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