

# Shooting timer

Firmware version 9

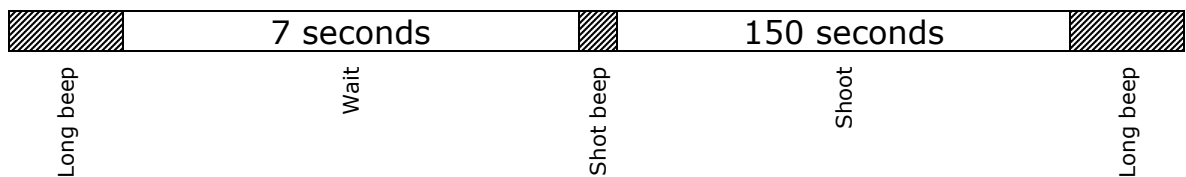
Imagine you are on a shooting range and you want to improve your shooting skills on a moving target, but the target can't move. What do you do? You could for example count the seconds and imagine that the target moves, but this is not a particularly good and accurate solution.

The shooting timer provides an audible visualization of a moving target that helps you concentrate and focus on the shooting and not on timekeeping.

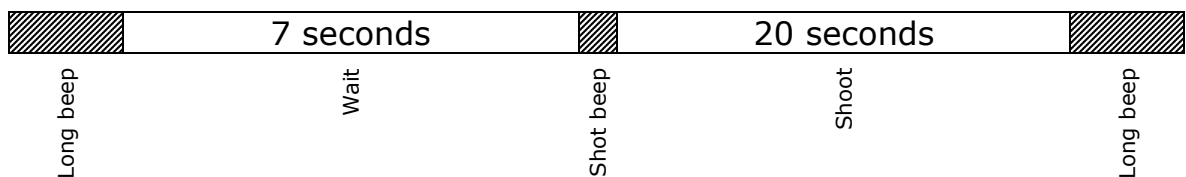
The shooting timer is a rather simple construction preprogrammed with three types of shooting categories; 25 meter standard pistol, 25 meter sports pistol and terrain pistol. Each category consists of up to three different disciplines.

## Category 1: 25 meter standard pistol

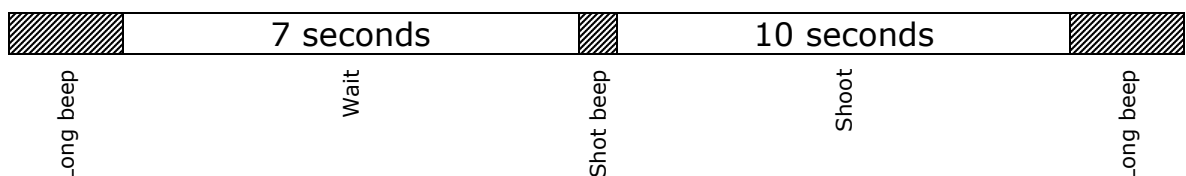
Discipline 1: 150 seconds to aim and shoot 5 times on the same target



Discipline 2: 20 seconds to aim and shoot 5 times on the same target

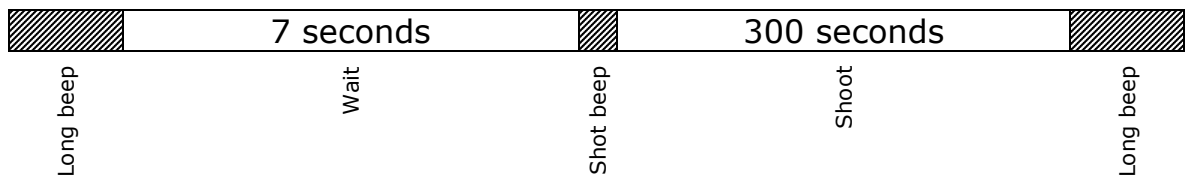


Discipline 3: 10 seconds to aim and shoot 5 times on the same target

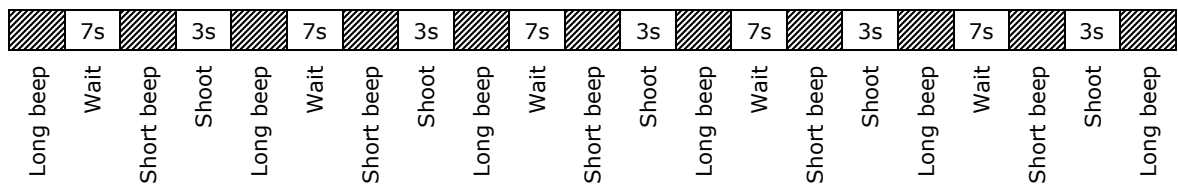


## Category 2: 25 meter sports pistol

Discipline 1: 300 seconds to aim and shoot 5 times on the same target

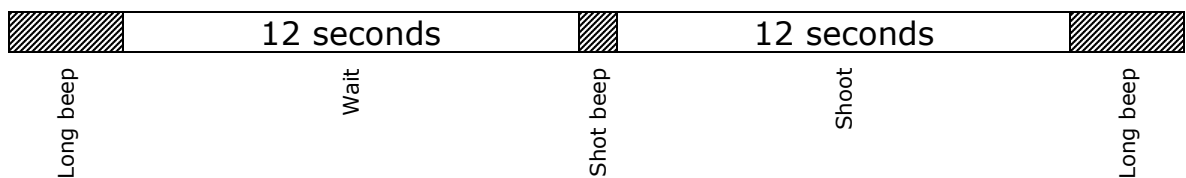


Discipline 2: 5 rounds of 3 seconds to aim and shoot 1 time on the same target

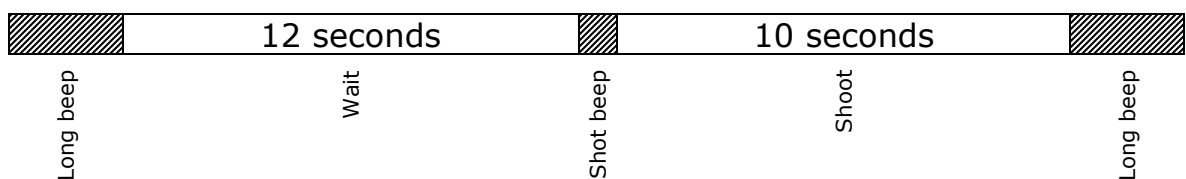


Category 3: terrain pistol (the shooting parameters are stored in the internal eeprom and can be changed)

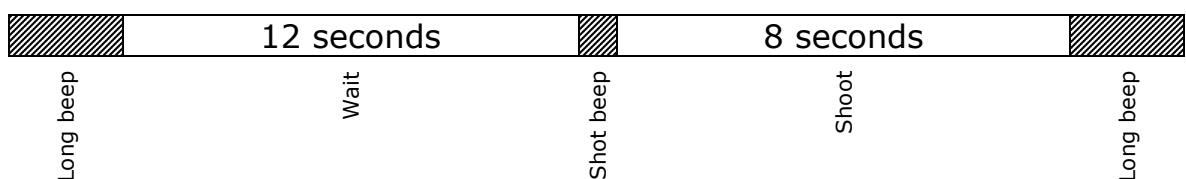
Discipline 1: 12 seconds to aim and shoot 5 times on different targets



Discipline 2: 10 seconds to aim and shoot 5 times on different targets

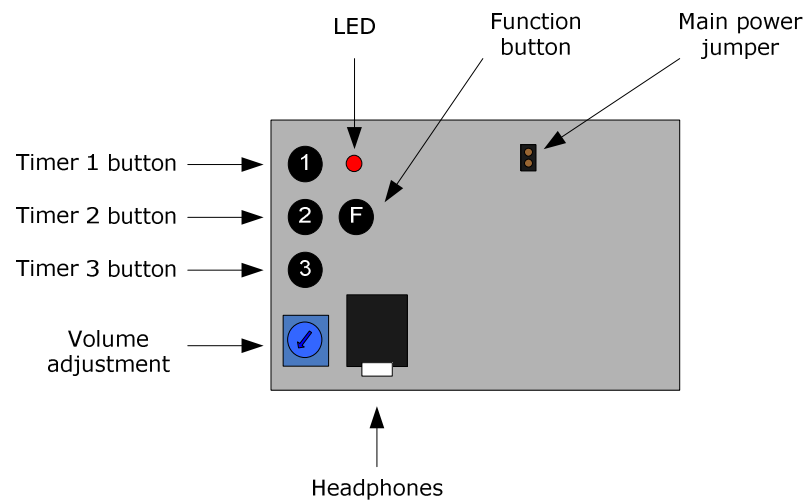


Discipline 3: 8 seconds to aim and shoot 5 times on different targets



### How to operate the shooting timer:

The shooting timer has 4 buttons, one red led, one volume adjustment knob and one main power jumper.

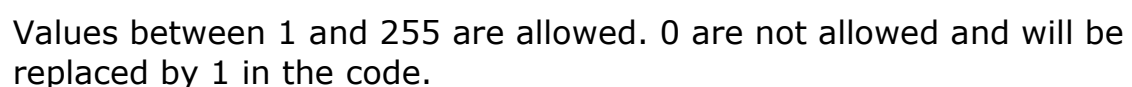


- The power jumper is used to switch on and off the battery. When the power is switched on the red led will show when the shooting timer is ready for use. If the shooting timer doesn't respond on the buttons, the jumper can be used to reset it.
- The red led indicates whether the shooting timer is on or is in standby mode. In standby mode the power consumption is only a few nA.
- The volume adjust knob is used to adjust the volume in the headphones.
- The function button has four different functions:
  1. Power on from standby mode; When the shooting timer is powered on you will hear one, two or three beeps depending on the last selected category before it went into standby mode.
  2. Toggle between the three shooting categories; When the categories are selected you will hear one beep for category 1, two beeps for category 2 and three beeps for category 3
  3. Interrupt a discipline; It is possible to interrupt the shooting timer when a discipline is active. In this case you will hear one long beep followed shortly after by one, two or three beeps depending on the selected category.

- The timer 1 button activates discipline 1 in the selected category
- The timer 2 button activates discipline 2 in the selected category
- The timer 3 button activates discipline 3 in the selected category

### How to change the shooting parameters for category 3

Address 2 : Waiting time (seconds) for discipline 1  
Address 3 : Shooting time (seconds) for discipline 1  
Address 4 : Number of times to repeat discipline 1  
Address 5 : Waiting time (seconds) for discipline 2  
Address 6 : Shooting time (seconds) for discipline 2  
Address 7 : Number of times to repeat discipline 2  
Address 8 : Waiting time (seconds) for discipline 3  
Address 9 : Shooting time (seconds) for discipline 3  
Address 10 : Number of times to repeat discipline 3



### How to calibrate the shooting timer:

The shooting timer uses the internal timer1 module to control the time in the different disciplines. When the timer overflows from FFFFh to 0000h it generates an interrupt which updates different variables and counters in the code. The timer is reloaded and started again. It continues like this until the shooting has ended.

Because the shooting timer uses the internal 4 MHz oscillator in the PIC12F675 the start value that is loaded into the timer should be adjusted to obtain a good accuracy.

The timer value is divided into two values, the lsb of the timer value and the msb of the timer value. The lsb and msb values are stored in the internal eeprom on the following addresses:

- The lsb of the timer value, t1, is stored in address 0
- The msb of the timer value, t2, is stored in address 1

DCh and 0Bh are stored in the eeprom as default values.

The calibration is performed in the following way:

1. Select shooting category 2 with the function button
2. Activate discipline 1 with the timer 1 button
3. Measure the length of the 300 second period with a stopwatch (start when you hear the short beep and stop when you hear the long beep) or something more accurate like a speedtimer (see <http://bygselvhifi.dk/speedtrainer.htm> or <http://bygselvhifi.dk/speedtimer.htm>).
4. Calculate the values to flash based on the time measurement:

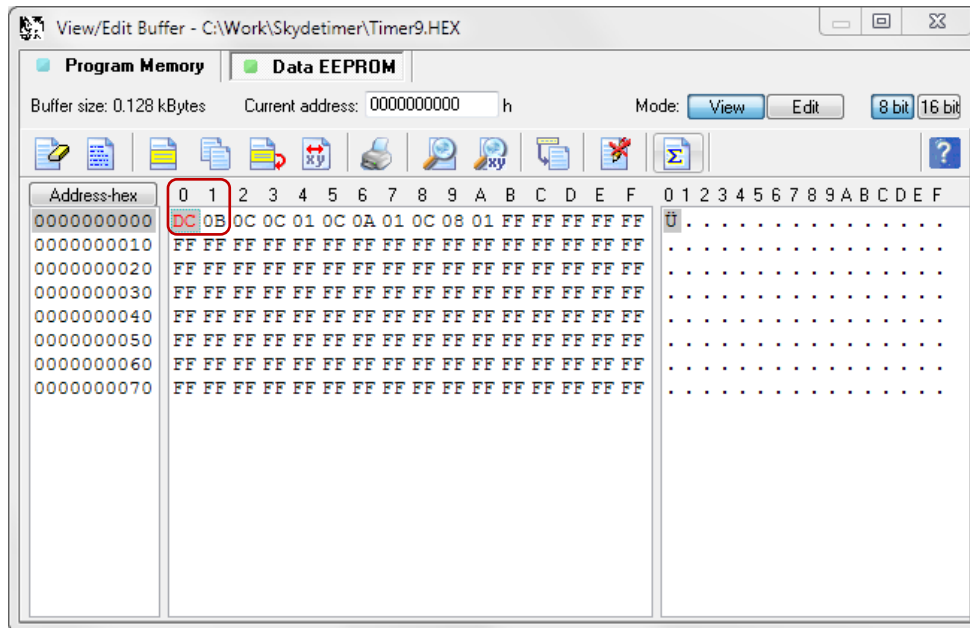
timer start value =  $3036 + (((\text{measurement in seconds} / 600) - 0.5) / 8) * 1E6$

t1 = timer start value Modulus 256

t2 = (timer start value - t1) / 256

You can use the Excel spreadsheet "Calibration.xlsx" to do the calculations.

5. Flash the two values, t1 and t2, into the eeprom at address 0 and 1



The shooting timer is now calibrated. A control of the accuracy could be performed if wanted. If a new calibration is necessary repeat the steps above. Note: Flash the default values, DCh and 0Bh, into the eeprom before calibration!