MICROGATE

WITTY

WIRELESS TRAINING TIMER

User Manual

Manual version 1.6.3

Firmware Versions:
Witty·TIMER: 2.39.46 – Witty·SEM: 2.1.11 – Witty·GATE: 2.0.14 – Witty·RFID: 2.0.5 - Witty·MANAGER: 1.5.16

Contents

1 Device Functions and Major Features 6
1.1 Contents of the Kit 7
2 Main Functions 8
2.1 Witty Timer 8
2.1.1 Switching On 9
2.1.2 Switching Off 9
2.1.3 Reset 9
2.2 Photocells 10
2.2.1 Mounting Photocells and Reflectors on Tripods 11
2.2.2 LED Statuses and Colors 12
2.2.3 Paired Photocells 13
2.3 Radio Transmission 15
2.3.1 Transmission Impulse Duration (Radio Power) 16
2.4 Elements of the Graphical User Interface 19
2.4.1 Virtual Keyboard 23
2.4.2 The Start (STA) and Stop (STO) Keys 24
2.4.3 The Lock Key (LCK) 24
2.4.4 Icons on the Header Bar 25
2.5 Power Supply and Charging 26
2.6 Witty·RFID 27
2.6.1 Basic operation 28
2.6.2 LED statuses and colours 29
2.7 Witty·SEM 30
2.8 Starting Pistol 32
2.8.1 Characteristics 32
2.8.2 Functions 32
2.8.3 Operation 33
3 Quick Setup: how to quickly carry out your first test 35
4 Test Types: 40
4.1 Basic 40
4.1.1 In Line 42
4.1.1.1 Enabling·Witty·SEM as the starting traffic light 45
4.1.2 Go & Back 51
4.1.3 Shuttle with Recovery 52

4.1.3.1 Enabling Witty·SEM 53
4.2 Multistart 55
4.2.1 Configuring the Photocells 55
4.3 Counter 58
4.4 Witty·SEM 61
4.4.1 Change Direction 61
4.4.2 Agility 66
4.4.2.1 Custom 67
4.4.2.2 Random 70
4.4.2.3 Random multicolour 71
4.4.2.4 Random multisymbol 71
4.4.2.5 Random multisymbol and multicolour 71
4.4.3 Standalone Change Direction 72
4.4.4 Autonomous Sequence 74
4.4.5 Tennis Shuttle 75
4.4.6 Cognitive Tests 77
4.4.6.1 Divided Attention 84
4.4.6.2 Double Decision 89
4.4.6.3 Mixed Signals 96
4.4.6.4 Hawk Eye 103
4.4.6.5 Eye for Detail 108
4.4.6.6 Juggle 112
4.5 Dual Test 117
5 Functions of the Witty Timer 119
5.1 Test 120
5.1.1 Simple Test 121
5.1.1.1 New 124
5.1.1.2 Delete Event 124
5.1.1.3 Ranking 125
5.1.1.4 Options 126
5.1.2 Preconfigured Test 132
5.1.2.1 Load 133
5.1.2.2 Sprint Start-Stop: timing of a BASIC In-Line Test 133
5.1.2.3 Go & Back: timing of a BASIC Go & Back Test 133
5.1.2.4 Shuttle 5x + 30": timing of a BASIC Shuttle Test 133

5.1.2.5 MultiStart Start-Stop: timing of a MULTISTART Test 135
5.1.2.6 Counter 10x: timing of a COUNTER Test 140
5.1.3 My Tests 141
5.1.3.1 Load 141
5.1.3.2 Edit 141
5.1.3.3 Delete 141
5.1.3.4 Cancel 141
5.1.4 Define New Test 142
5.2 Results 145
5.2.1 Show 145
5.2.2 Continue 145
5.2.3 Sort/Filter 145
5.2.3.1 Sort 145
5.2.3.2 Filter 146
5.2.3.3 Reset Filter 147
5.2.4 Delete 148
5.3 Athletes 149
5.3.1 Show 149
5.3.2 Sort 150
5.3.3 Delete 150
5.3.4 Cancel 150
5.4 Settings 151
5.4.1 Radio 152
5.4.1.1 Verify Signal 152
5.4.1.2 Frequency 153
5.4.1.3 Photocell Mode 154
5.4.2 Units 156
5.4.2.1 Measurement Unit: 156
5.4.2.2 Precision 157
5.4.2.3 Speed 157
5.4.3 Display 158
5.4.3.1 Brightness 158
5.4.3.2 Screen Time-Out 159
5.4.4 Date & Time 160
5.4.4.1 Set Date 160

5.4.4.2 Set Time 161
5.4.4.3 Date/Time Format 161
5.4.5 Language 162
5.4.6 Peripherals 163
5.4.7 Witty·SEM 164
5.4.8 Sound 165
5.4.9 Miscellaneous 166
6 Connecting to a PC via *Witty Manager* 167
7 Technical Data 168
7.1 Witty Timer 168
7.2 Witty GATE Photocell 169
7.3 Witty·SEM 170
7.4 Witty·RFID 171
8 Declaration of Conformity 172
8.1 FCC Conformity 173
8.2 Japan/EU MRA: Certification by Type of the Ordinance Concerning Technical Regulations Conformity of specified Radio Equipment (MPT Ordinance No. 37 of 1981) 173

1 DEVICE FUNCTIONS AND MAJOR FEATURES

WITTY is a training timing system ideal for all sports where assessing athletic performance through sprint, speed, endurance, reaction, shuttle tests, etc. is essential.

Thanks to the timer and photocell-integrated radio system (which do not require special official authorization), the large color display, the modern user interface featuring icons, and the practical padded backpack, setup and use is extremely easy and fast.

The system is largely expandable with the possibility to add (single or double) photocells for intermediate times, accessories such as starting pads, time displaying LED boards, direction indicators, etc.

The kit comes with a free Windows software (which can be downloaded from our website) called *Witty Manager* for importing data of performed tests and viewing it in numerical tables and graphs, managing a complete athlete personal data base (transferring the athlete's picture to the timer for fast identification), creating customized test types and updating the timer and photocell firmware.

1.1 CONTENTS OF THE KIT

Basic kit (art. £WIT001):

- 1 Witty timer
- 2 photocells
- 2 reflectors
- 4 tripods
- 1 backpack
- 1 wall power supply (with 4 different plugs for all world standards) + 3 USB cables for charging the timer and 2 photocells simultaneously
- 1 USB-PC cable
- 1 USB memory stick containing Witty manuals and Witty manager software
- 1 cord

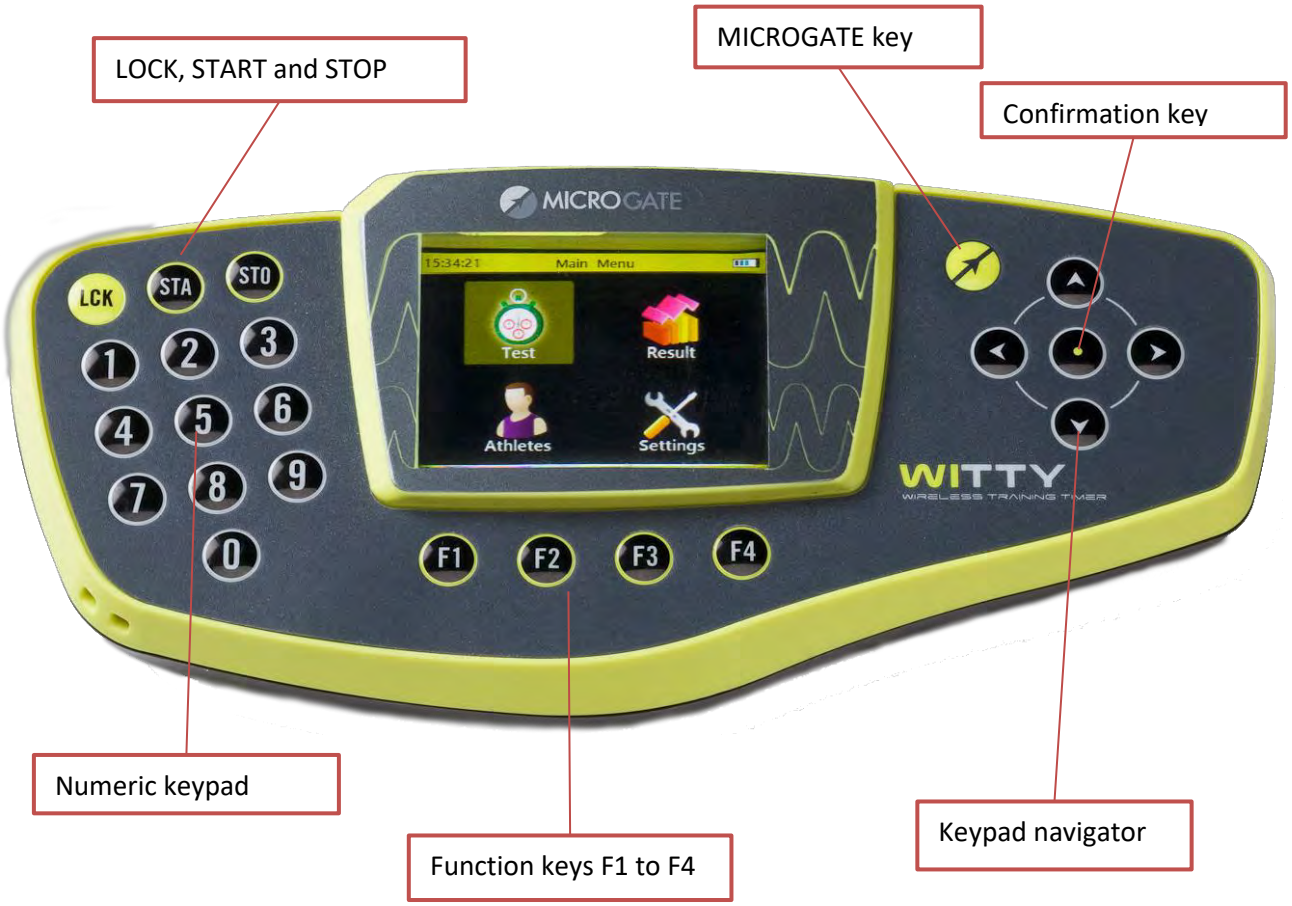
The kit can be expanded purchasing more photocell and reflector pairs with tripod ('Lap Time Kit', art. £WIT002) for managing more lap times.

Both kits (Basic and Lap Time) are available with a 'Double Photocell' option (see chapter 2.4; the relevant article codes are £WIT003 and £WIT004)

2 MAIN FUNCTIONS

2.1 WITTY TIMER

The figure below shows the main parts of the Witty timer, which will be explained hereafter.



2.1.1 Switching On

To switch on the Witty timer press the <*Microgate*> key. After a few seconds required by the boot loader, a screen is displayed showing the installed firmware version. Press any key to go to the Main Menu.

2.1.2 Switching Off

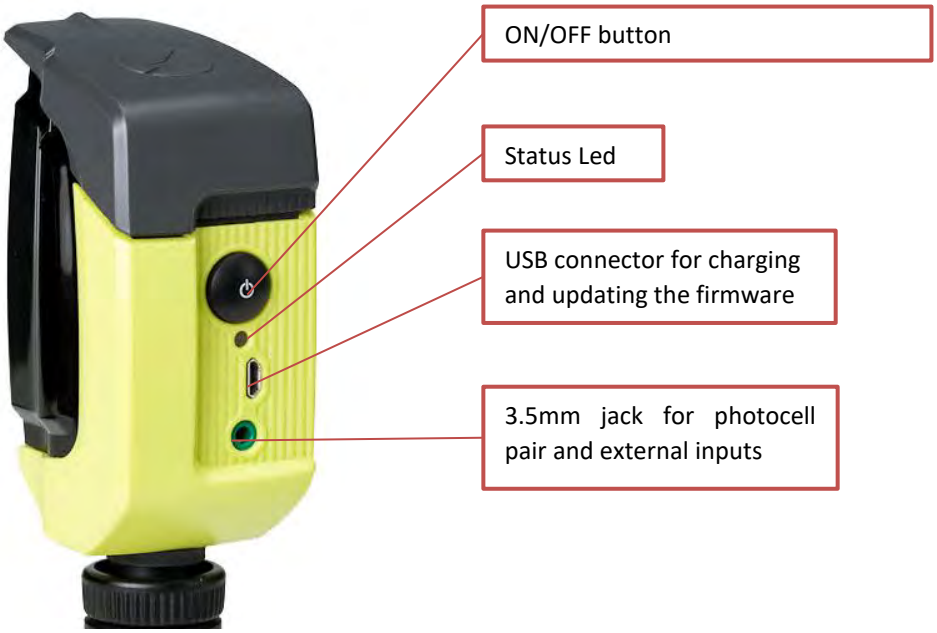
From any screen press the <*Microgate*> key and hold it **for 5 seconds**.

Another screen prompts to confirm switching off the timer. Press <*F1*> to confirm or <*F4*> to cancel.

2.1.3 Reset

If the timer does not respond to any command, press the <*Microgate*> key and hold it for **at least 10 seconds**. When the key is released, the device will be reset and switched off. Press the key again to switch on.

2.2 PHOTOCELLS



To **switch on** the photocell press the ON button for one second; the status LED blinks with a green light (if the battery status is sufficient) or with an orange light (if the battery status is low). A continuous beeping sound is produced until the **correct alignment** with the reflector (or a similar reflecting surface) is found.

To **switch off** the photocell press the button until the LED turns red, then release it.

2.2.1 Mounting Photocells and Reflectors on Tripods

To mount the photocells and the reflectors on the tripods supplied with the kit, proceed as follows: remove the little platform from the top of the tripod and screw it onto the photocells and under the reflectors (the platform is square-shaped and therefore allows 4 mounting directions with respect to the tripod). Mount the devices onto the top of the tripod inserting the front of the platform, and then the rear until the tab clicks into place.

Extend the tripod legs until the required height has been reached (usually the photocell must be interrupted by the chest of an athlete), and position the photocells and the reflectors at a distance of 1-7 meters (see also chap. 5.4.1.3 on setting 'Normal' or 'Strong' mode depending on the position).

2.2.2 LED Statuses and Colors

PHOTOCELL OFF	
STATUS	***STATUS LED***
• Battery charged/empty	Off
• External supply • Battery charging	Orange blinking light
• External supply • Battery charging completed	Green steady light

PHOTOCELL ON	
STATUS	***STATUS LED***
NORMAL Mode • Battery charged • Battery empty	 Green - Pause Red - Pause
BOOTLOADER Mode • The photocell has not been switched on pressing the ON/OFF button but by connecting the USB cable to a PC. This activates the BootLoader HID and the firmware can be updated.	 Red - Green
CONFIGURATION Mode • When switching on, the ON/OFF button is pressed for at least 5 seconds and configuration mode is activated.	Red blinking light

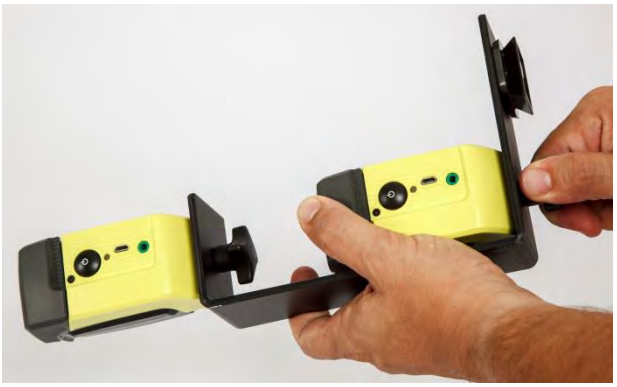
PAIRED PHOTOCELL Mode: Master photocell (higher serial number) • Battery charged • Battery empty Slave photocell (lower serial number) • Battery charged • Battery empty	 Green - Pause Red - Pause Green fast blinking light Red fast blinking light

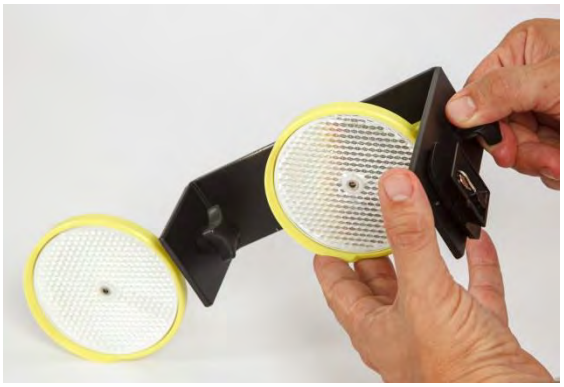
2.2.3 Paired Photocells

To prevent the photocell being interrupted by an athlete's arm swinging forward, in official competitions or in any case when measurement must be as accurate as possible, the use of paired photocells is necessary.

This setup ensures that time is measured exactly when the athlete's chest crosses the line, as the impulse (start/stop/lap, depending on the position) is given only when both photocells are interrupted.

To mount the photocells, screw the C bracket onto the tripod platform, the photocells, and the reflectors, as shown in the figure (the photocells are mounted at 90° with respect to the C bracket).





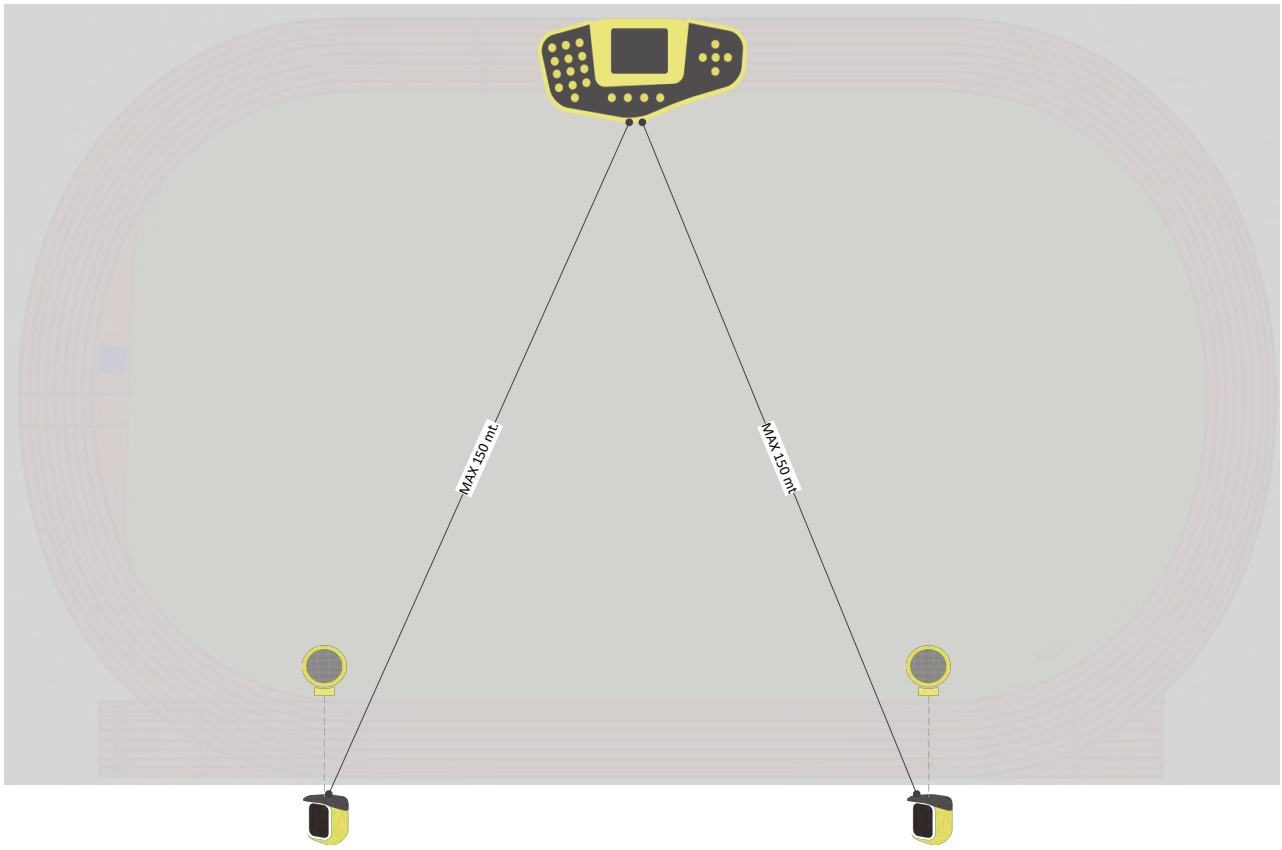
Then mount the bracket onto the tripod and connect it with the photocells using the jack-jack cable. The **MASTER** photocell is the one with the *higher serial number* (see chap. 5.4.1.1) and *blinks more slowly* than the **SLAVE**. As the Master photocell transmits the signal to the timer, to ensure a wider aerial range, the latter should always be mounted *on top*.

Master:
Higher S/N, blinking at regular speed.
Always on TOP!

Slave:
Lower S/N, blinking fast.

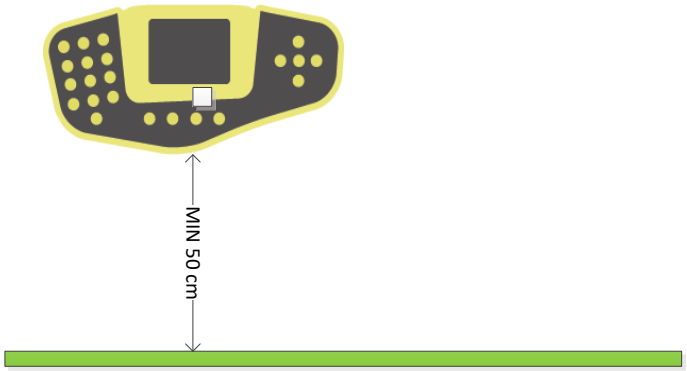
2.3 RADIO TRANSMISSION

The suggested maximum distance to keep in order to prevent reception problems is 150 meters. It is in any case advisable to check the signal quality with the procedure described in chapter 5.4.1.1.



In **case of rainy weather** radio transmission can be disturbed by the water drops and therefore the maximum distance must be reduced.

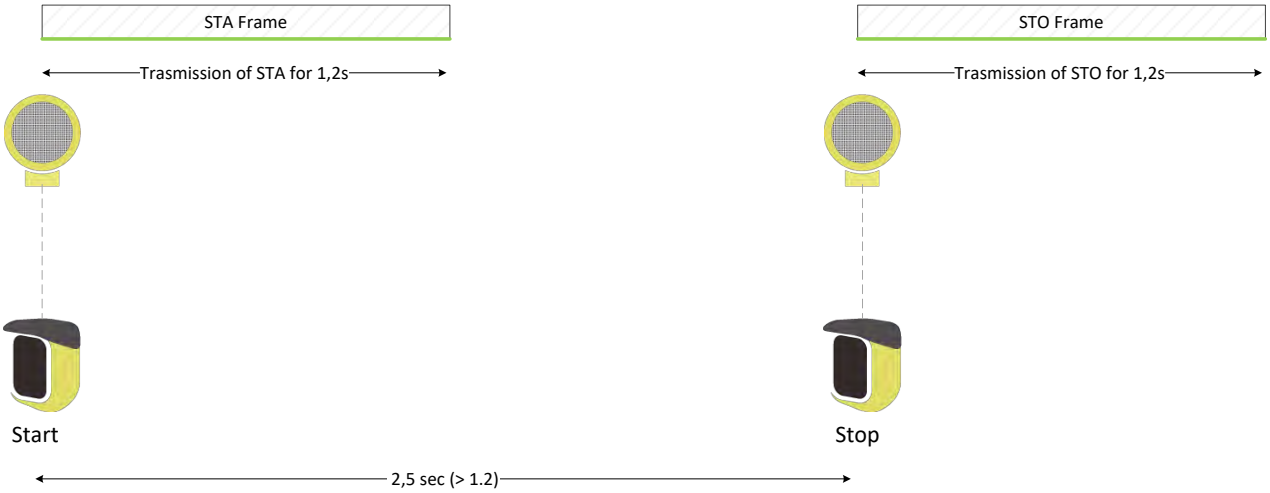
In order to obtain excellent reception, position the Witty timer at **a height of at least 50 cm** (without touching the ground) and **do not place it on top of metal objects**.



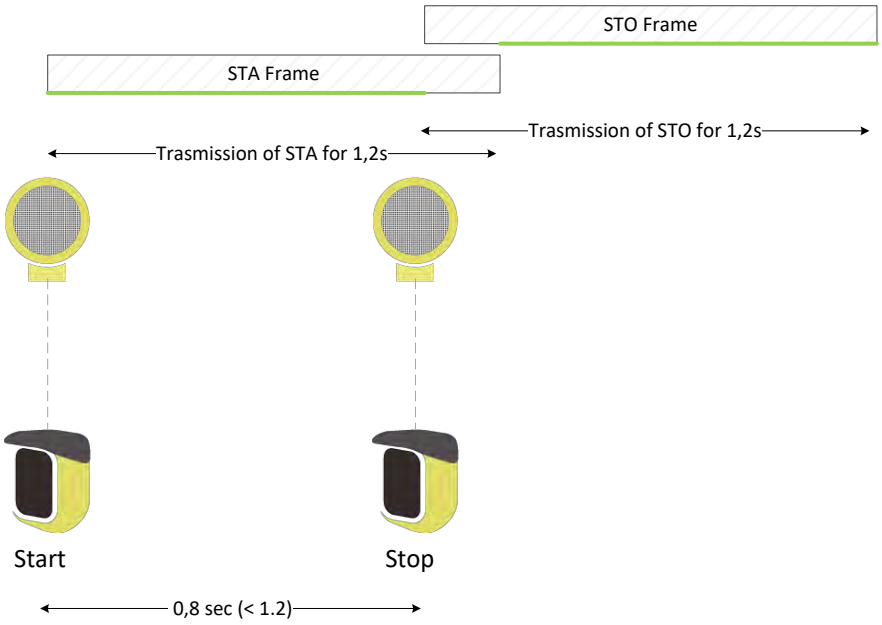
2.3.1 Transmission Impulse Duration (Radio Power)

To increase the reliability of the radio transmission, the data bundles of the photocell impulses are transferred repeatedly for a set period of 1.2 seconds. This allows to have redundant information when losing some data bundles and to rebuild the event with absolute precision.

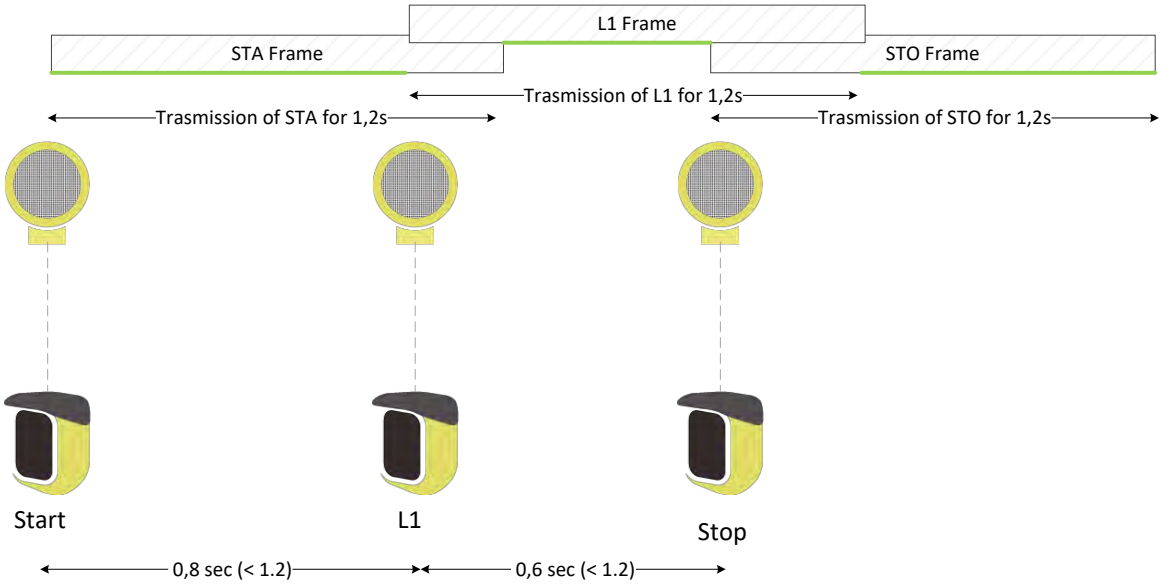
If between two impulses (e.g. start photocell and stop photocell) more than 1.2 seconds elapse, there are of course no problems whatsoever.



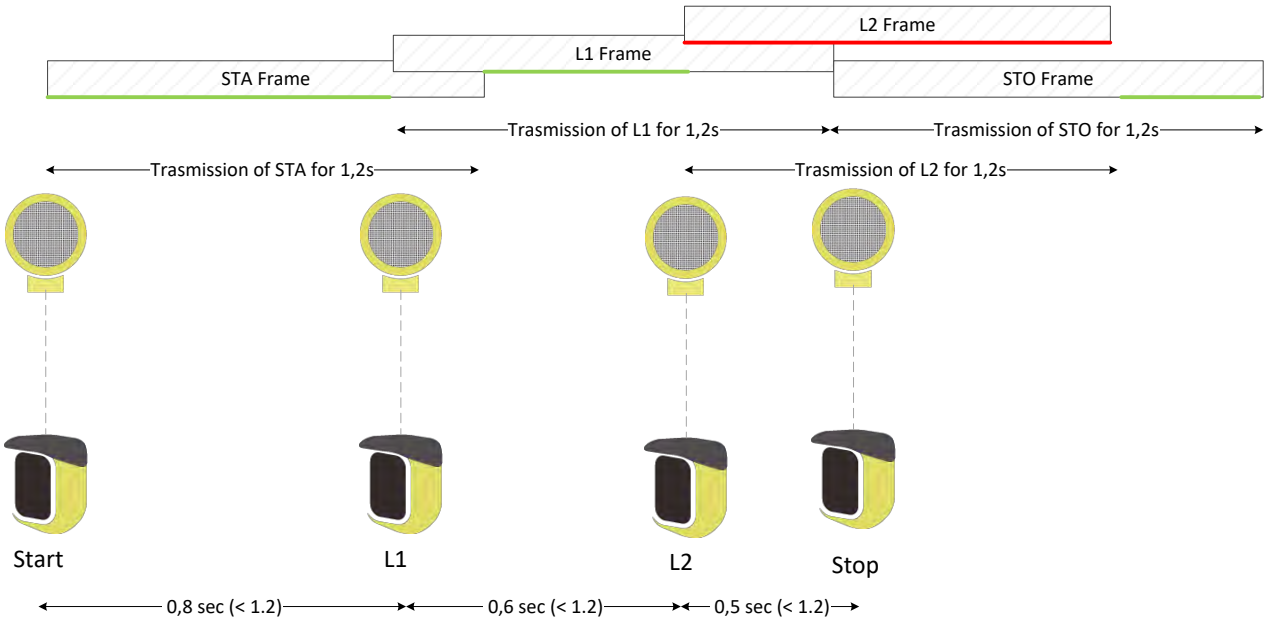
Even if the difference is smaller, the second impulse will still be detected, as it will always have a longer "tail" than the first one.



Problems may arise when intermediate (Lap) times are added and are very close one to another or between start and stop. Once again it is not necessary that the impulse delta is higher than 1.2 sec, it is enough if the impulse has a "period" (green line) where there are no other impulses.



If on the other hand there are several and very close intermediate times, one of these might be "completely" covered by the previous or following impulses (as in the case of L2 in the figure below), and therefore it would not be detected.



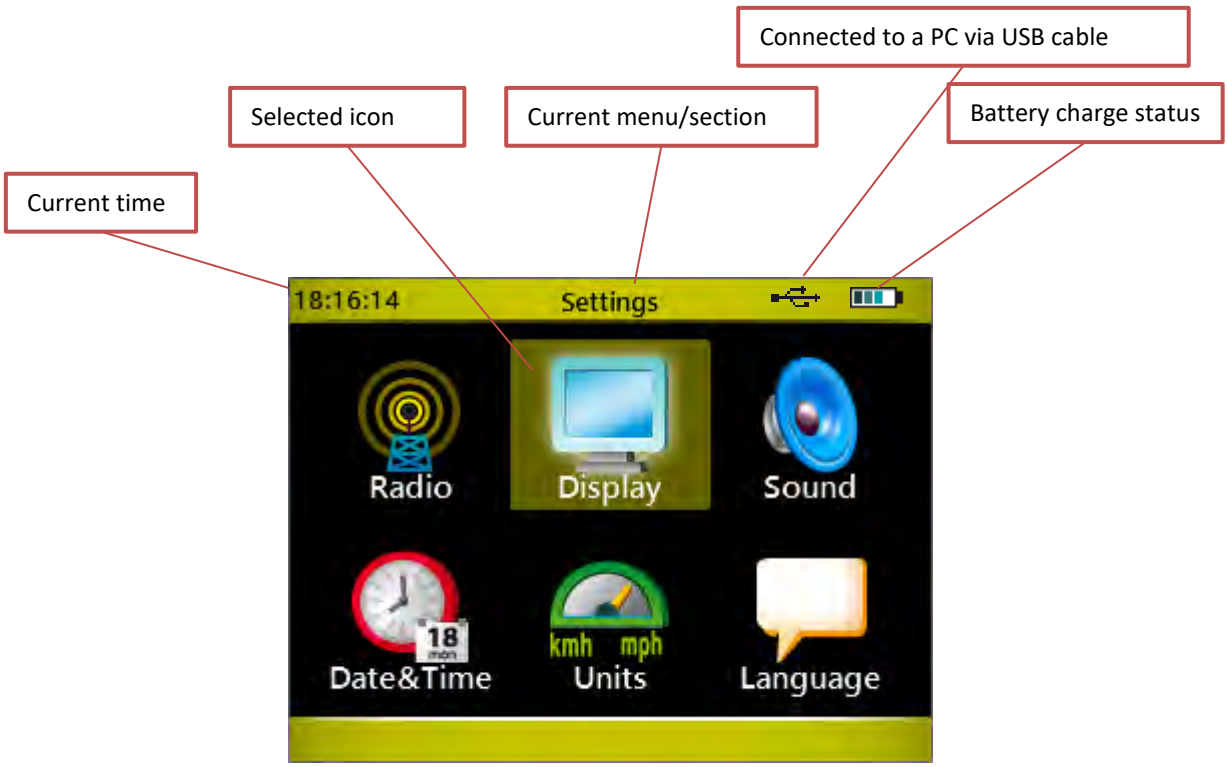
To minimize this problem in case of very fast passages between one photocell and another, the transmission time can be reduced by one third, i.e. from 1.2 sec to 0.4 sec (see chap. 5.4.1.3.2).

In this case the duration of the impulse transmission is very short and allows a closer setup of the photocells, but with lower transmission reliability (as fewer redundant bundles are sent). It is advisable to use this mode (Radio Power = Short) only with the Witty timer close to the photocells and in ideal usage conditions (see chap. 2.3).

In any case, regardless of the impulse distance, if two impulses are *perfectly* simultaneous (to the millisecond), one of them will necessarily be lost. For instance, in a multistart test, where the athletes start while others are on the circuit, if one athlete's stop occurs exactly at the same time as the another athlete's start, one of the signals will not be detected.

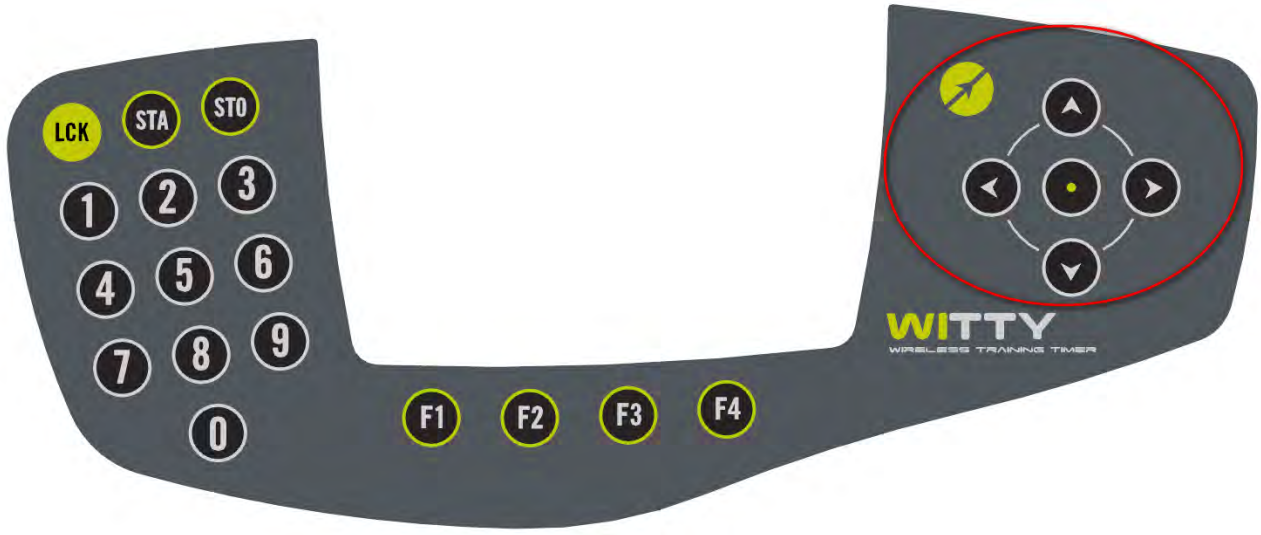
2.4 ELEMENTS OF THE GRAPHICAL USER INTERFACE

The Witty timer features an interface with icons and commands similar to those used in modern mobile phones and smartphones. Let's take a look at the main icons and how to use them.

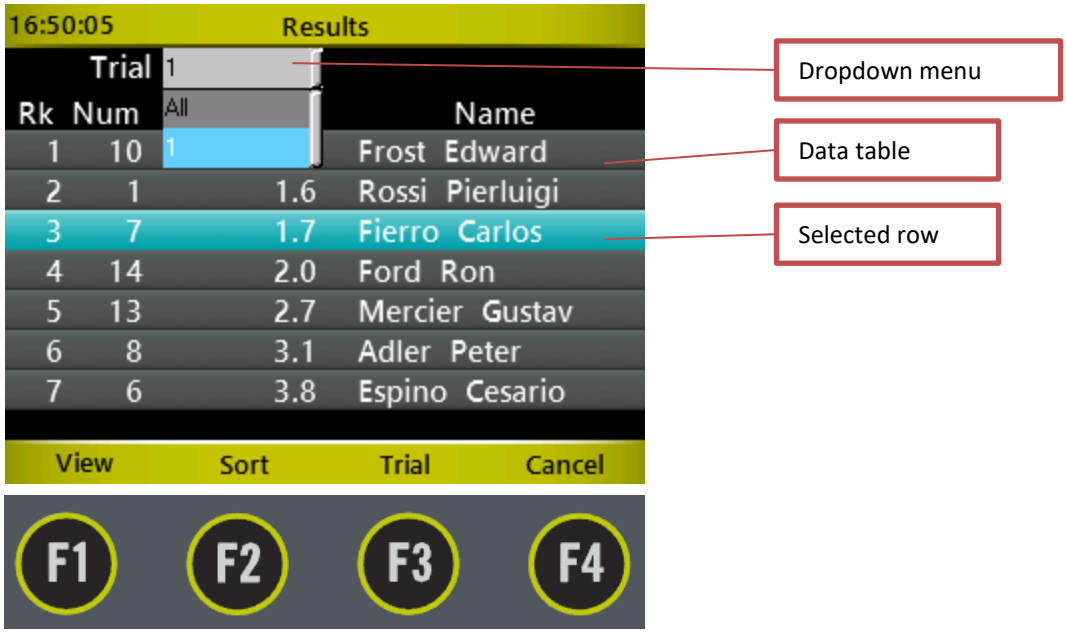


To browse the menus, use the four keys of the <*keypad navigator*>. When the icon of the required command is selected (icon outlined in yellow), press the center <*Confirm/OK*> key to access the relevant function.

To go back to the previous screen or in any case when the regular BACK or ESC function is needed, pres the <*Microgate*> key.



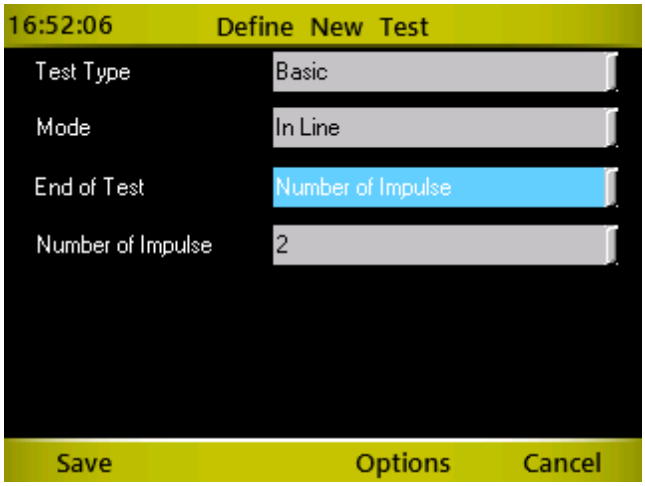
When **commands** are shown in the lower part of the display (inside the yellow portion), they can be selected using the corresponding <*function key*>

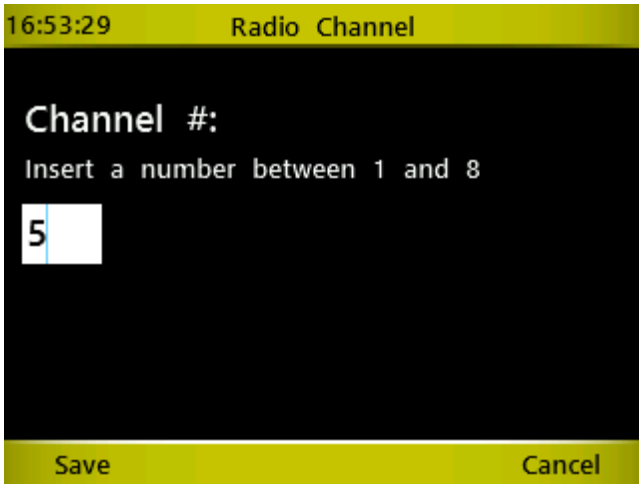


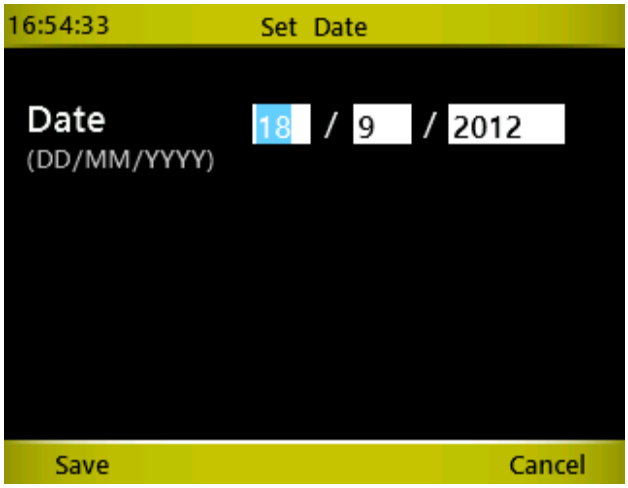
If the **Data Tables** consist of one or more columns, the rows can be scrolled with the <*up*> and <*down*> arrow keys; the selected row is then highlighted in light blue. Press the <*OK*> key or one of the <*Fn*> keys to interact depending on the context. Pressing the <*right*> and <*left*> arrow keys has the same effect as the PgDn and PgUp keys on a PC, i.e. the list is scrolled down by pages.

In order to open a **dropdown list**, press the relevant function key (in this case *F3* labeled 'Test') or the <*up arrow key*>; the dropdown menu opens showing all elements, which can be scrolled using the <*up*> and <*down*> arrow keys, and the required item confirmed with <*OK*>.

On screens having more than one dropdown menu, use the <*up*> and <*down*> arrow keys to select the desired dropdown menu, then press <*OK*> to open it. Again use the <*up*> and <*down*> arrow keys to scroll the items, and finally confirm the selected item by pressing <*OK*>.







If you need to **type a number**, the cursor is automatically positioned inside the field. Use the <*numeric keypad*> to enter the required number, and confirm with <*F1*> (Save) to save the data.

If there are several numeric fields (e.g. date or time input) confirm with <*OK*> in the various fields to go to the next one.

As there is no delete (Del/Backspace) key, in case of mistakes just retype the number. Depending on the context, the fields accept a finite number of digits (e.g. for a date only 2), so the entered data overwrites the previous one.

e.g. If you want to enter the number 18 in the day field, but you have typed 81, just type 18 again and you will obtain the following results:

press 1

press 8

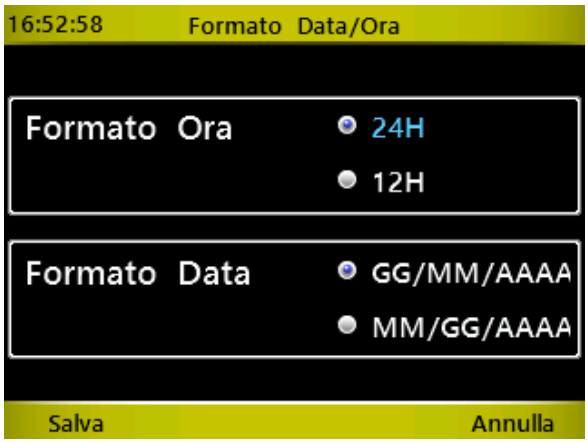
For selecting items having **exclusive selection buttons (radio buttons)**, proceed as follows: with the <*up*> and <*down*> arrow keys select the required item, which turns light blue; press <*OK*> to set the option.

If you want to change the language from Italian (currently selected option) to Spanish

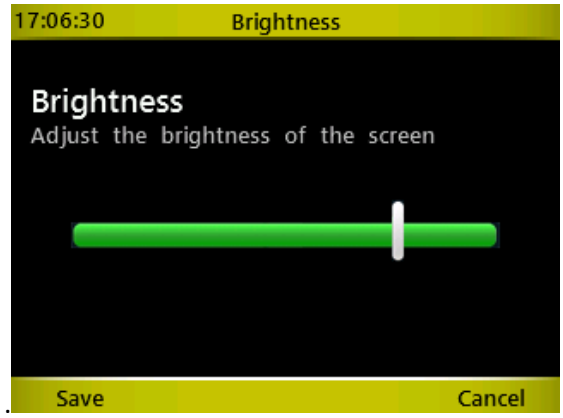
Move the cursor until the item is highlighted in light blue and press <*OK*>.

Remember to SAVE by pressing <*F1*>

In case of **various radio button groups** on the same screen, follow the same steps.



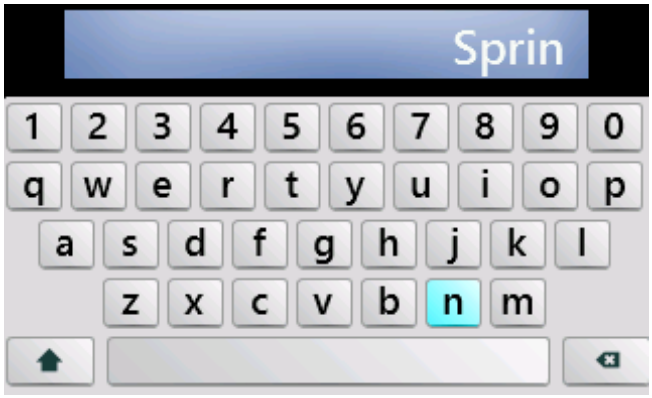
If there are control items such as **sliders** (e.g. for setting the display brightness), move the arrow using the <*right*> and <*left*> keys, and save by pressing <*F1*>



As you might have already noticed from these screens, the **<*F1*> and <*F4*> keys** are often the opposite of each other and in general it is true that the <*F1*> always corresponds to Confirm, Save, Yes, whereas <*F4*> is used for Cancel, Back, No. Mainly in prompts requiring confirmation it is common to use **<*F1*> = YES and <*F4*> = NO**.

2.4.1 Virtual Keyboard

After having defined a customized test type (see chap. 5.1.4) it can be named using the virtual keyboard.



Use the four <*arrow*> keys to hover over the required letter (highlighted in light blue) and press <*OK*> to enter.

Use the shift key (⬆) to toggle between capital and small letters. Pressing it once, only the first letter is capital (e.g. the first letter of the name), whereas by pressing the <OK> key twice, the CAPS-LOCK function is enabled (all capital letters).

In order to delete a mistyped letter, press BackSpace

2.4.2 The Start (STA) and Stop (STO) Keys

In the top right corner of the timer there are the STA and STO keys simulating the events recorded by the photocells set as start and stop. These impulses can be given manually to:

- start a test manually giving the first impulse and then manage the following using the photocells (e.g. a counter test, where only one photocell is used to count repetitions)
- generate a lap time when the athlete passes in a certain point when using 2 photocells (press the STA key, which is also used as LAP)
- end a test manually, if for some reason an athlete has not interrupted the photocell (passing too close to or below it)
- 'play' with the timer learning how to use it in manual mode

2.4.3 The Lock Key (LCK)

The Lock key interrupts radio impulse reception by the photocells and the inputs from the 3.5 mm jack. The keyboard (and therefore also the STA and STO keys) remain enabled.

If, for example, an undesired person is crossing the finish line (a judge, another athlete, etc.), reception can be interrupted simply by pressing the <*LCK*> key

A padlock on the header bar indicates that the timer's reception is 'locked'; to reactivate it press the <*LCK*> key again.

2.4.4 Icons on the Header Bar

The top part of the timer (Header bar) displays the current time, as well as the a series of icons relevant to the current screen:

	Battery charged 100%
	Battery charged 75%
	Battery charged 50%
	Battery charged 25%
	Battery running low
	This indicates that the battery has been charged completely and the timer can be disconnected from the PC or the wall power supply.
	When charging, the battery gets very hot. Disconnect from the power supply and wait until it has cooled down.
	The timer battery is being charged via the PC or wall power supply.
	The timer is connected to the PC via USB cable.
	The LCK key has been pressed and photocell impulse reception, as well as 3.5 mm jack reception are disabled.

2.5 POWER SUPPLY AND CHARGING

When the device batteries are low they can be recharged simultaneously for as many as 4 devices.

The Witty Timer battery icon level decreases with the decreasing battery charge and turns red when the battery is almost empty.

Low battery charge on the photocells, Witty·SEM and Witty·RFID is indicated by the RED-PAUSE status LED (see chap. 2.2.2).

To recharge them use the power supply and connect the plug that is compatible with your national grid format (Europe, UK, USA, Australia). Connect the USB cables to the power supply and the devices to charge.

The plug icon on the Witty Timer next to the battery icon indicates the charging progress.

On the photocells, Witty·SEM and Witty·RFID (if switched off), the status LED turns orange and blinks.

Both devices can be charged connecting them both to a PC, but charging takes longer (480 mW instead of 800 mW of the wall power supply).

2.6 WITTY·RFID

Witty·RFID is an automatic athlete detection system that makes the trainer's work easier by not having to insert the bib (or shirt number) of the person who is starting in the Witty timer.

The player, supplied with a previously configured bracelet/watch, will simply approach the RFID reader located near the start and his name, number and photo will automatically appear on the timer display (this information is managed and downloaded via the Witty Manager software).

An acoustic beep and a series of green LEDs that light up indicate that the data was received and read correctly.

The washable rubber silicone bracelets have a white space on the "face", where the assigned number can be written after programming. Programming is done using the Witty Manager software (refer to the Witty Manager software manager, chapter 3.1.4, for more information) and the same RFID reader that is connected via USB to a PC.

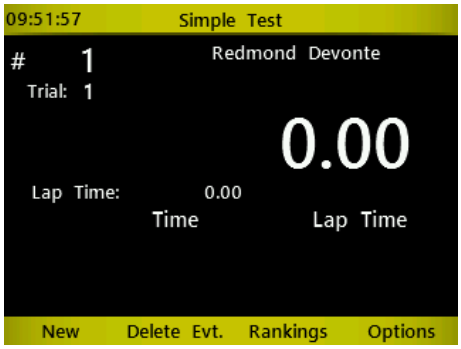
With Witty·RFID, timing is therefore completely automated, the coach/trainer does not have to do anything on the timer and can therefore concentrate on the athletes, following them during the test.

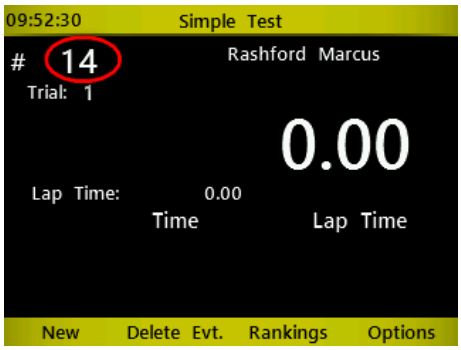
2.6.1 Basic operation

Place the Witty timer in start mode in any one of the test types (e.g. the basic test described in the chapter 0). Instead of entering the number of the starting contestant, bring one of the bracelets (which was previously "numbered" with the Witty Manager software) to a distance of approx. 2 cm. from the Witty·RFID.

The LEDs on the reader will light up green and an acoustic signal confirms that the scan was successful. The bib number is transmitted via radio to the Witty timer, which sets it immediately for starting. The maximum distance of the timer and the optimal radio transmission conditions are the same as described in chapter 2.3.

When the proximity sensor detects any object, the 5 front LEDs turn blue, whereas if a bracelet comes near it that has not been "numbered" yet or if there is a RFID chip reading error, the LEDs turn red.





2.6.2 LED statuses and colours

FRONT LEDS	
STATUS	***STATUS LED***
• Bracelet with bib number detected	Green
• Bracelet without bib number detected or scanning error	Red
• Non RFID obstacle detected	Blue
REAR LED	
Witty·RFID OFF	
STATUS	***STATUS LED***
• Battery charged/empty	Off
• External power supply • Battery charging	Orange blinking light
• External power supply • Battery charging completed	Green steady light
Witty·RFID ON	
STATUS	***STATUS LED***
NORMAL mode • Battery charged • Battery empty	 Green - Pause Red - Pause
BOOTLOADER Mode • Witty·RFID has not been switched on pressing the ON/OFF button but by connecting the USB cable to a PC. This activates the BootLoader HID and the firmware can be updated.	Red - Green
CONFIGURATION mode • When switching on, the ON/OFF button is pressed for at least 5 seconds and configuration mode is activated	Red blinking light

2.7 WITTY·SEM

Witty·SEM is an innovative training and rehabilitation system that can be scaled and configured in a simple and quick manner to meet different needs. Witty·SEM is basically a traffic light integrated with other products of the Witty family, consisting of a 7x5 LED matrix that is able to manage different contents, such as:

- Colours: Red, green and blue
- Arrows in different colours
- Numbers
- Letters

Witty·SEM is centrally controlled by the witty timer via a radio transmission system with a range of up to 150 m, which makes it possible to model the different types of training and analysis in a completely flexible and reliable manner. Up to 16 traffic lights can be managed from a single Witty console with data acquisition in real time.

Witty·SEM makes it possible to train and test athletes regarding specific movements depending on the different types of sports or requirements, targeting their cognitive-motor skills and abilities in order to prepare them.

Witty·SEM can be used in two different ways:

- As a **start traffic light and countdown** in all available Basic, MultiStart and Counter tests (see chap. 4.1.1.1); usually only one Witty·SEM is used
- As a training system for **Agility or Direction Change tests**, between 1 and 16 can be used (see chap. 4.4)

If you have more than one traffic light available, the first thing to do is to make sure that each has been configured with a different address (from A to R). The address can be seen directly on the traffic light right after it is turned on.

It is configured using the Witty Manager software (see the Software manual in chapter 3.4 for details)

2.8 STARTING PISTOL

2.8.1 Characteristics

Three functions in one:

- Starting pistol for athletics
- Whistle for group sports
- Siren for swimming.

The system can be connected to the Witty Timer or the Witty Gate photocell (not included in the pistol kit) for time recording. It is supplied with an amplifier cable and, on request, with a timer cable.

A padded case to protect the system for easy transport.

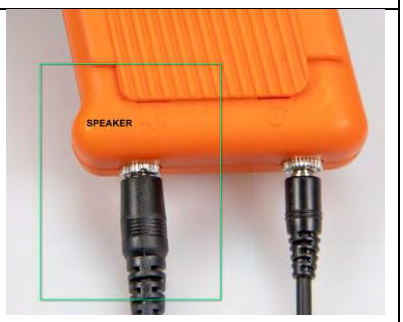
The system is battery powered: 3 x 1.5 V AA alkaline batteries.

Warnings: To avoid fire or electronic hazards, do not expose the unit to rain or moisture.

2.8.2 Functions

Acoustic signal: starting pistol, siren, whistle.
Visual signal: When the trigger is pressed, a light signal (in the form of a flash at the front of the pistol) can be emitted simultaneously in addition to the sound. This function can be deactivated to save on battery consumption.

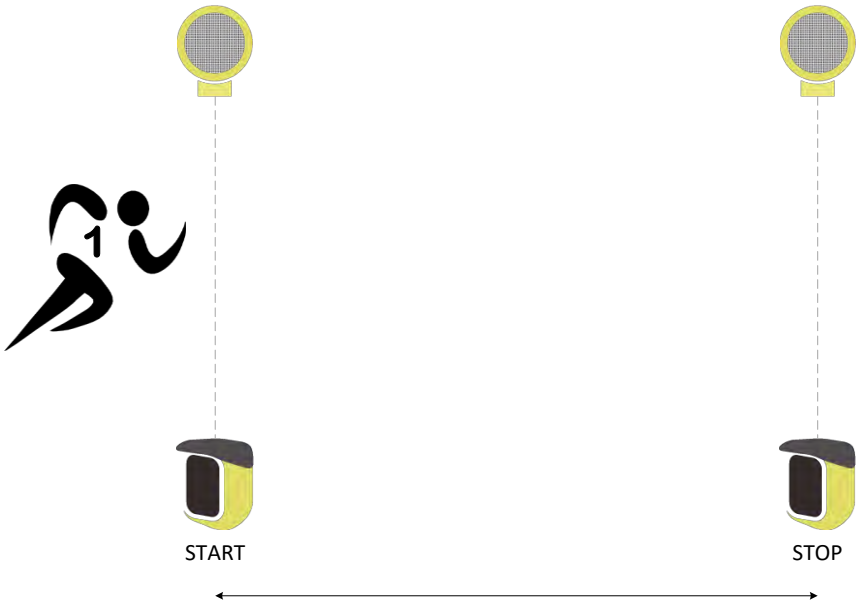
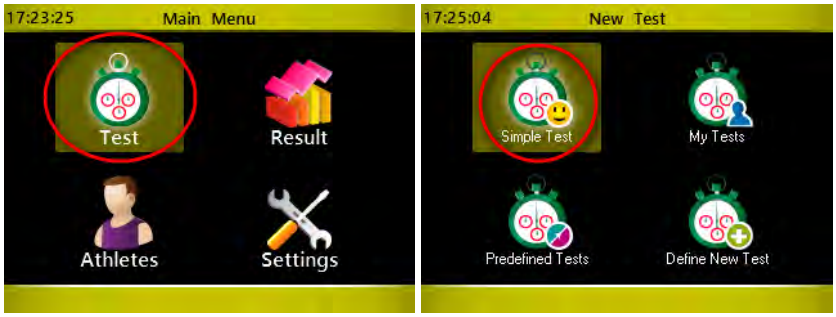
2.8.3 Operation

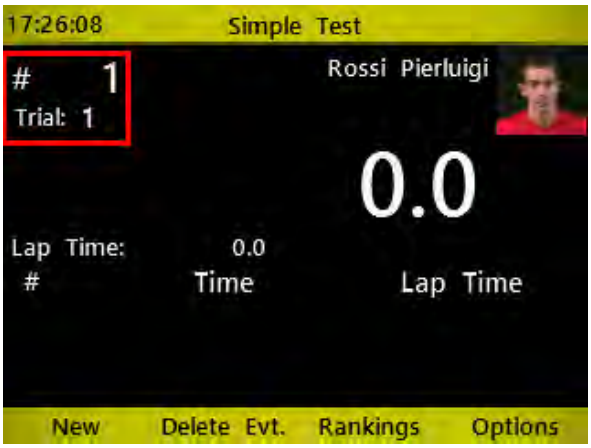
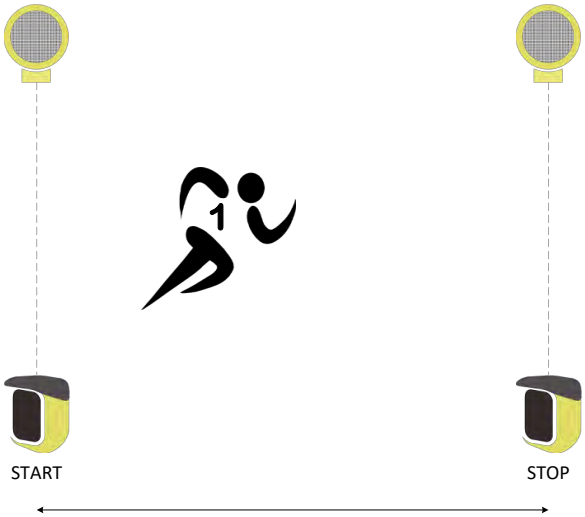
1	Insert the batteries in the dedicated compartment on the handle, after removing the door with the special screwdriver.	
2	Connect the pistol output to the mini speaker port with the connection cable	
3	Switch to audio mode. The power indicator light comes on.	
4	Select the desired sound: starting pistol, siren or whistle.	
5	In “pistol” mode, the light signal can also be activated by selecting the “audio and flashes” icon When the “CHARGED” light comes on, you are in “pistol” mode with the sound and light flash activated, ready to give a *start signal.* You will need to wait a few seconds for the pistol to charge the flash (see point 8).	
6	Start: when the trigger is pressed, the selected acoustic signal – and bright flash, if selected – is emitted.	
7	False start: for the signal, pull the trigger immediately after the start of the race to obtain a double sound effect. You will need to wait for the “CHARGED” light to come on (wait about 3.5 seconds) before you can use it again.	
8	If there is no false start, the “CHARGED” light will come on automatically after about 3.5 seconds for a new start.	

9	To send the start impulse to the Witty timer system, the pistol can be connected to any device in the Witty family (timer, photocell, etc.) using the dedicated output.	

3 QUICK SETUP: HOW TO QUICKLY CARRY OUT YOUR FIRST TEST

In a few steps we will show you how to carry out your first test:

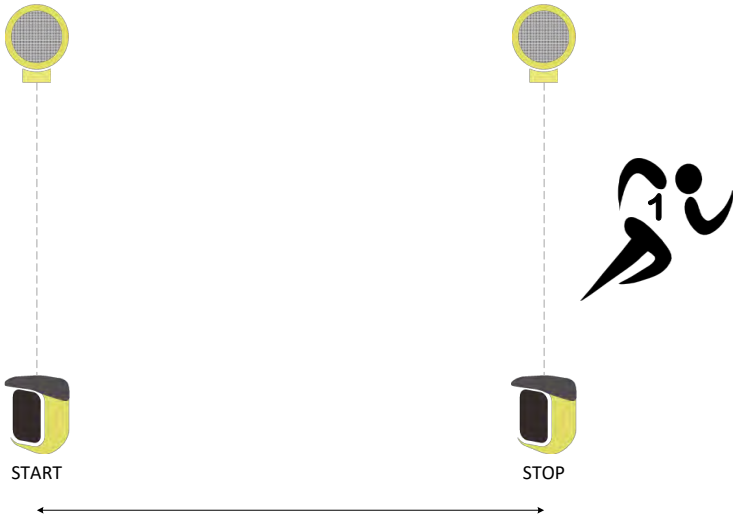
Switch the Witty Timer on (chap. 2.1.1).	
Mount the photocells onto the tripods and turn them on (chap. 2.2.1); position the start and finish photocells at a certain distance.	
From the main menu select Test and then Test Base.	

<table>
<tr>
<td>In the top left corner the athlete's number as well as the athlete's trial number are displayed.</td>
<td> 
</td>
</tr>
<tr>
<td>The athlete starts and as soon as he crosses the first photocell timing begins.</td>
<td> 

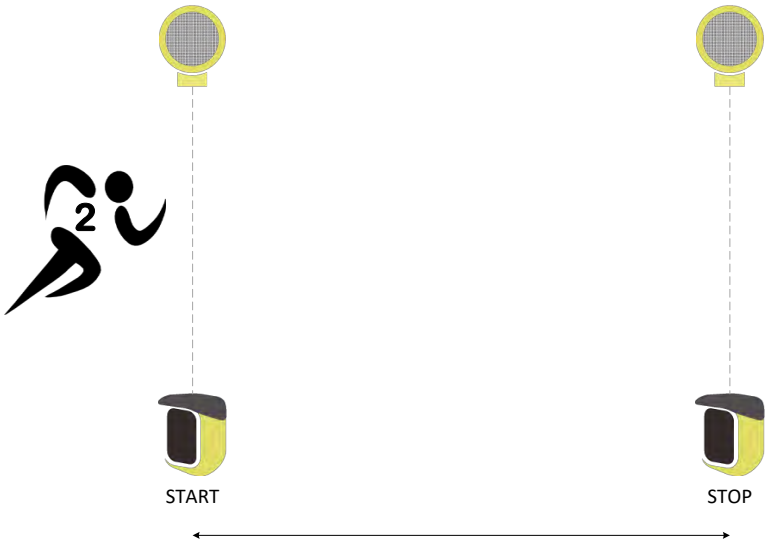
</td>
</tr>
</table>

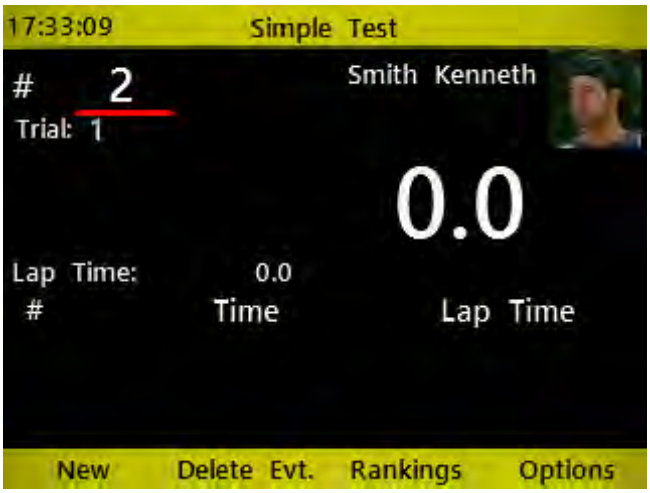
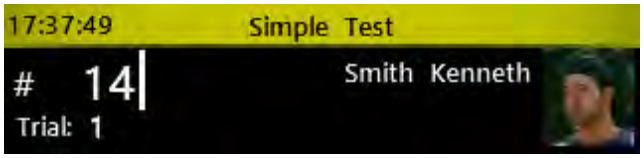
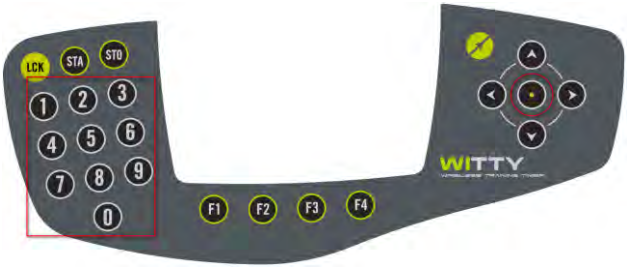
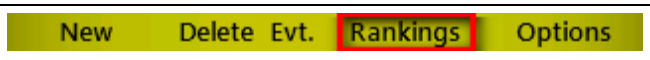
When the athlete interrupts the finish photocell, timing is stopped and a line is generated in the table at the bottom of the screen.

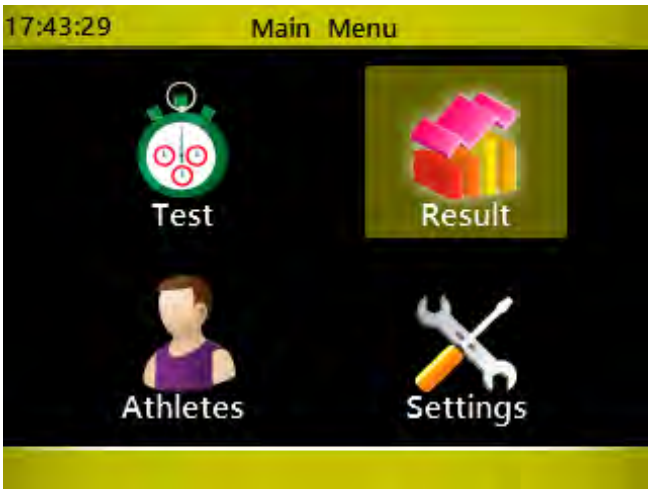
After 3 seconds timing continues, because as default all photocells are set as start photocells and do not receive a stop impulse, but this does not affect the performance of a test.



Press <*F1*> under 'NEW' for another athlete (in this case bib #2).



Press <*F1*> to confirm another athlete's start.	 
If the athlete has another bib number just enter the number using the numerical keypad and confirm by pressing <*OK*>.	 
The <*F3*> Rankings button can be pressed at any time to show the temporary ranking of the test.	

Pressing the <*Microgate*> key (which can always be used for Back/Esc) or <*F4*> takes you back to the timing screen.	
When all athletes have finished their test, press the <*Microgate*> key to exit the Test menu (confirmation required)	
Press the <*Microgate*> key again to return to the main menu. It is possible to review the test (ranking), continue or delete it from the Result menu (see chap. 5.2)	

When the test session has been completed, switch off the timer (chap. 2.1.2) and the photocells (chap. 2.2.1)	

4 TEST TYPES:

Witty can handle various test types (sprint, shuttle, go & back, athlete groups, repetitions, etc.), which are described below.

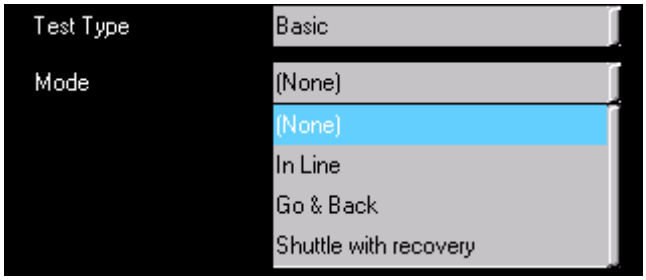
Tests are divided into the following main types:

Icon	Name	Description
	BASIC	Tests for in-line timing of single athletes (one after the other) in laps or circuits (sprint, shuttle, go & back, endurance, etc.).
	MULTISTART	Test for timing several athletes (max. 3) simultaneously.
	COUNTER	Test for timing or counting repeated actions.
	WITTY·SEM	Test for agility and change direction performed with Witty·SEM

The various options available for each main type are explained below.

4.1 BASIC

The basic tests are divided into different sub-types:



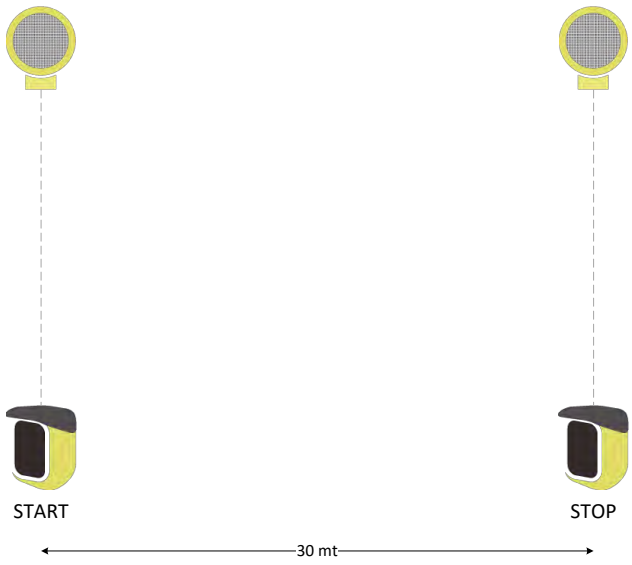
For every type it is necessary to define when and how the test is completed (**End of Test parameter**). Possible options are:

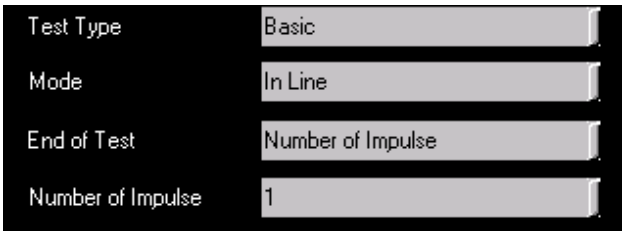
Number of Impulses:	Choosing a finite number of impulses (e.g. 5) the test will be completed when the timer receives a number of events equal to the set parameter except for the first Start event. Leaving the parameter on '0' (undefined), the test never ends and the operator will decide when another athlete begins the test.
End of Time	Setting a time in minutes:seconds, the test will finish when the set amount of time is reached**.**
No. of Impulses or End of Time	Setting both parameters, the test ends when the first of the two conditions is reached.

4.1.1 In Line

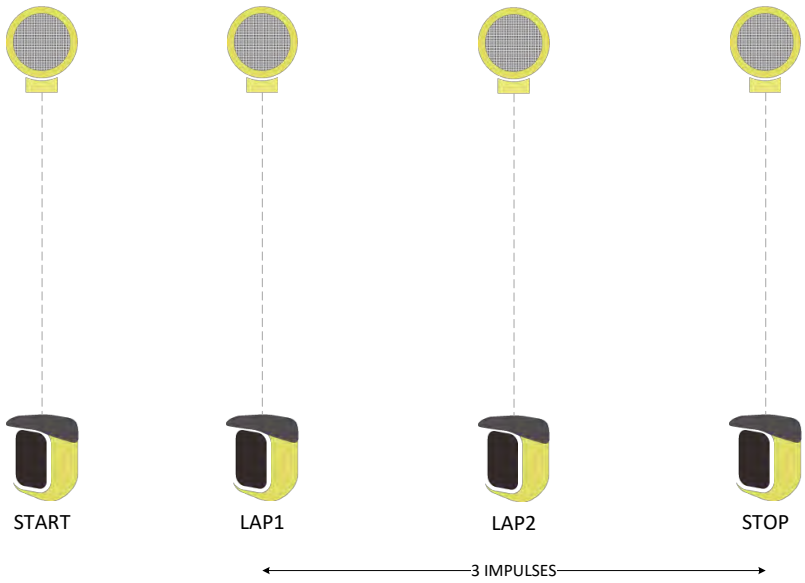
Basic / In Line tests are the simplest kind of tests and allow, for example, sprint timing over a certain distance.

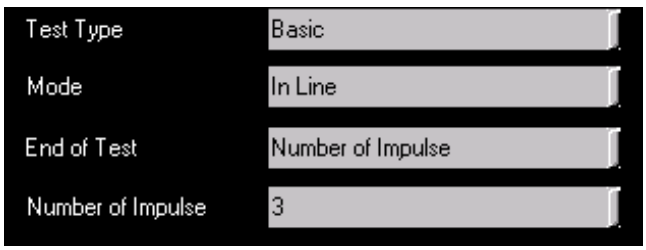
Example 1a. To time a sprint test over 30 meters with Start and Stop it is enough to set the End of Test with **'Number of Impulses'** equal to 1 (please note that the Start Impulse must never be counted).





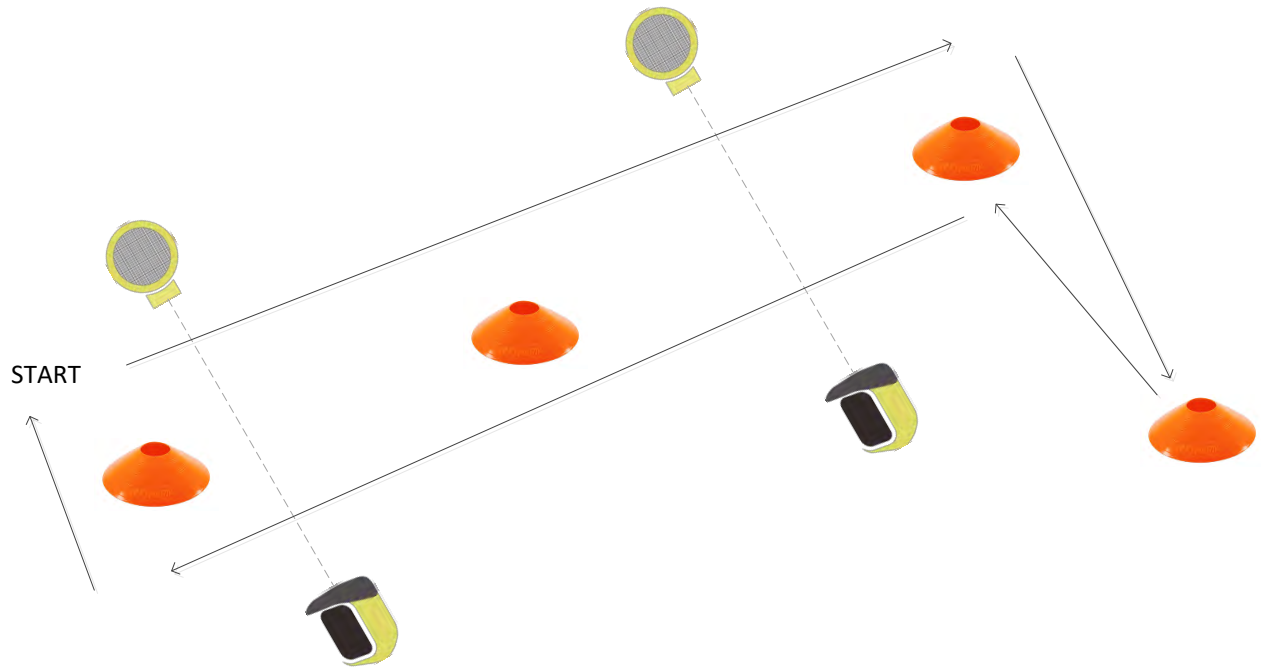
Example 1b. If you want to add one or more lap times, just increase the value of Number of Impulses.



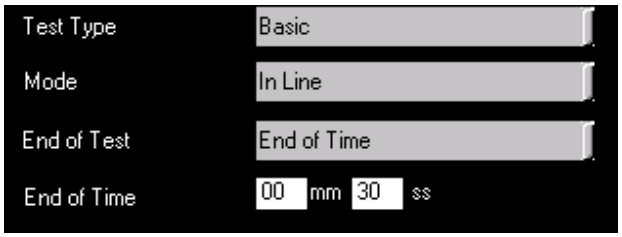


The End of Test parameter set to **'End of Time'** is useful for test types where a given number of actions must be carried out in a certain amount of time. These actions can be counted via the number of impulses received from the photocell.

Example 2: Checking how often photocells are passed within 30" of this course:



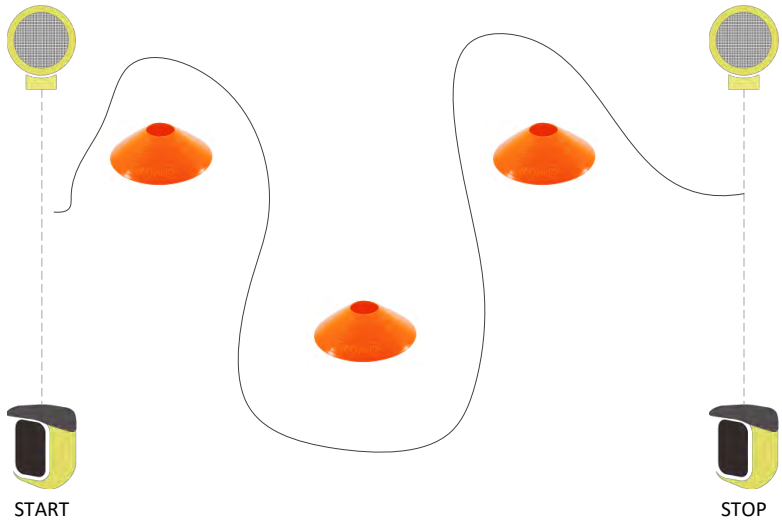
The test will finished as follows:

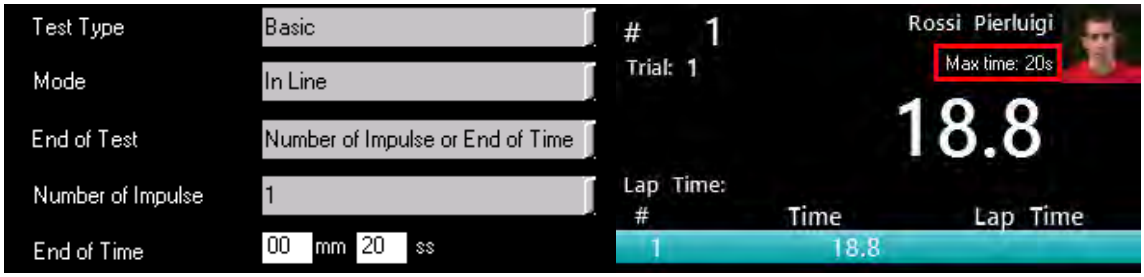


The ranking shows information by position (Pos), number of impulses (#), bib (Num), time, and possibly the athlete's name. The winner is the one with the highest number of impulses or, in case of tie, the one who was the fastest.

Bib 14 and 1 made six passages, whereas number 8 and 9 only five; the ones with the same amount of passages are ranked by time.

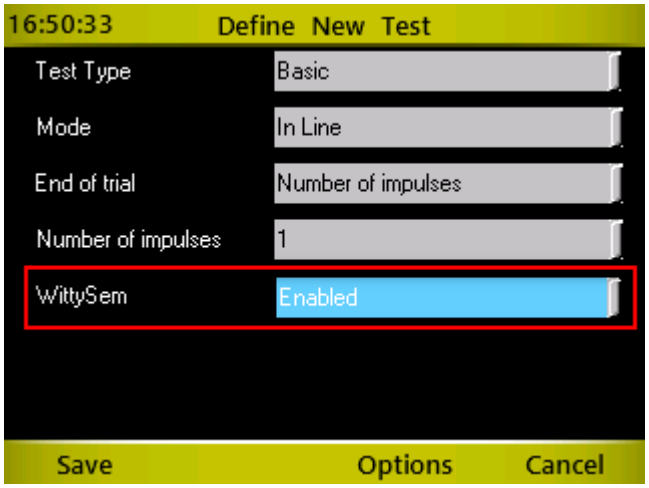
Example 3. If in a test an athlete must complete a circuit within 20" and there is only one start and stop, the end of test can be set as '**Number of Impulses or End of Time**'; if the athlete manages to perform the test, his time will be saved, otherwise the timer is stopped.



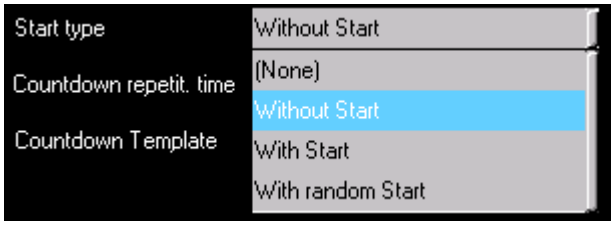


4.1.1.1 Enabling·Witty·SEM as the starting traffic light

The last parameter that is found in every type of test is the possibility to use the Witty·SEM as a starting traffic light with a predefined countdown that shows athletes when they can start.



Once this selection has been enabled, press <*F3*> Options and then select the Witty·SEM Options icon



The next screen is used to select the following parameters:

"**Type of start**" it can be defined as:

Without start Witty·SEM displays every "n" minutes:seconds (defined with the "Countdown repetition timer" parameter) the sequence of the selected countdown.

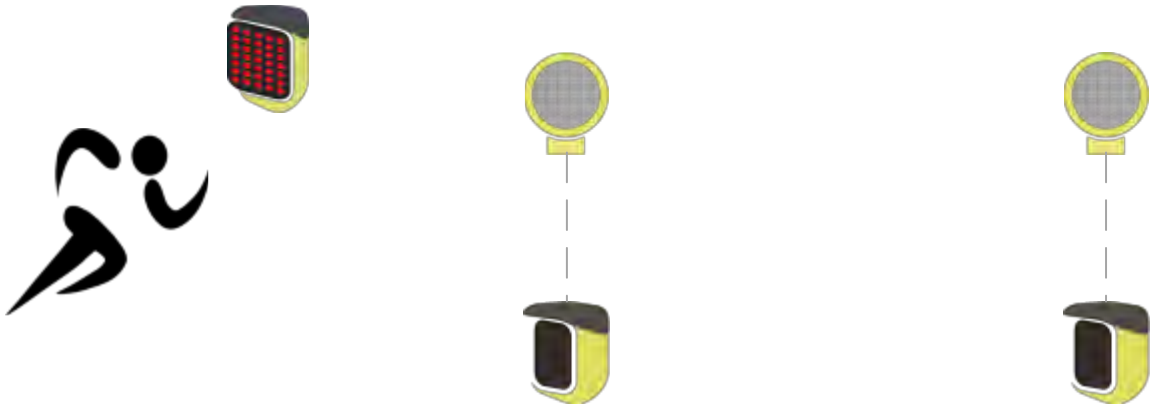
With start Like above, but a radio START impulse is generated at the end of the countdown and the timer starts to time the current athlete.

With random start Like above, but the start impulse is not generated immediately after the countdown, but after a random period of time that does not exceed the "Random time" parameter

The second parameter "**Countdown repetition time**" (mm:ss) indicates how often the cycle is repeated, whereas "**Countdown Template**" makes it possible to select one of the 3 predefined types of countdowns (3, 5, 10 seconds). In the case of "Start type" or "With random start" it is possible to indicate within what period of time the start is generated ("**Random time**")

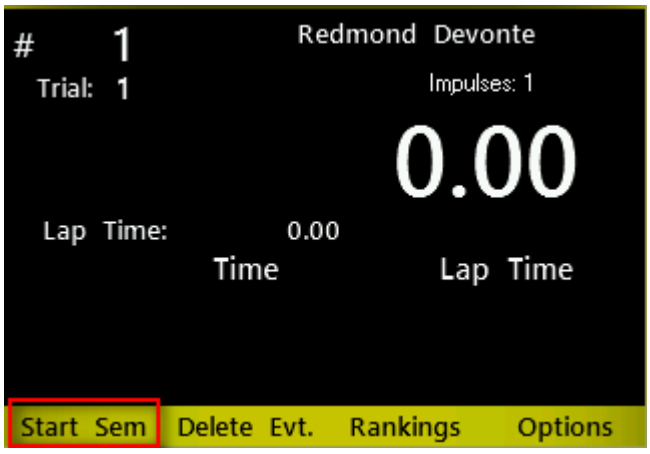
Here are a few examples:

Example 1: Start every 45 seconds, with a 5 second countdown, without start generation (as it is taken by the first photocell)

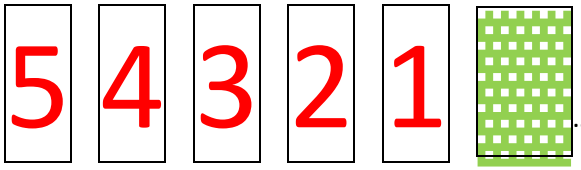


The traffic light is in stand-by with its index displayed in blue

The first traffic light start takes place manually by pressing the button <*F1*> Start Traffic Light

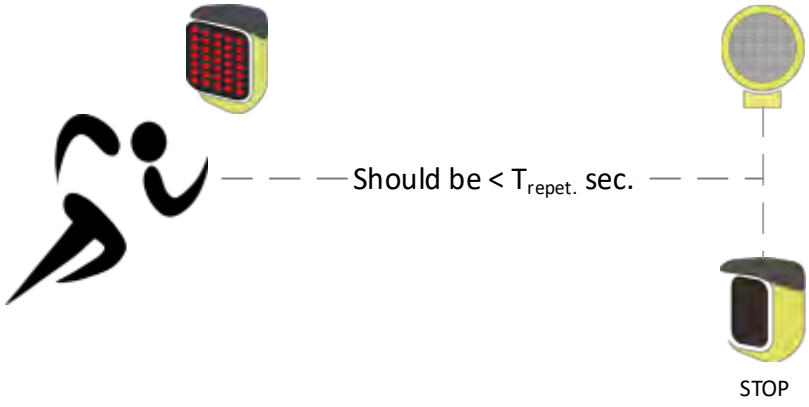


Witty·SEM carries out the selected countdown (5 sec.) and then immediately displays the green signal for 5 seconds.



…wait 35 seconds (45 – 5 for the countdown – 5 for the green) and restart

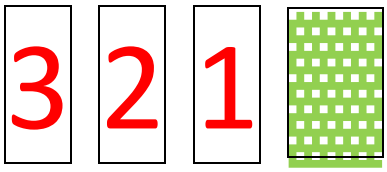
Example 2: Start every 30 seconds, with a 3 second countdown and generation of the start impulse (the start photocells is not required)



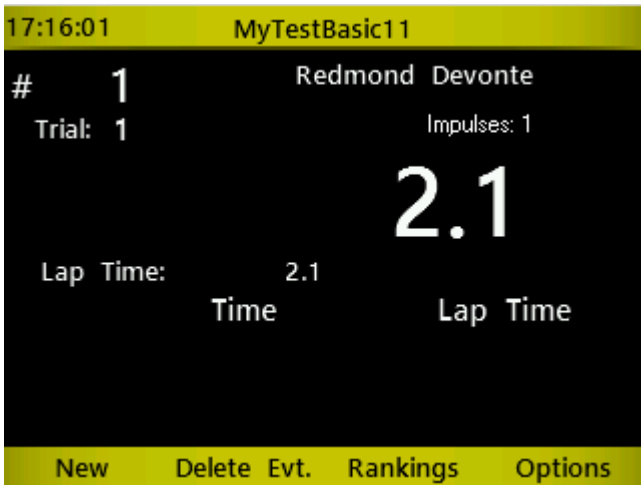
The traffic light is in stand-by with its index displayed in blue

The first traffic light start takes place manually by pressing the button <*F1*> Start Traffic Light

Witty·SEM carries out the selected countdown (5 sec.) and then immediately displays the green signal for 5 seconds.



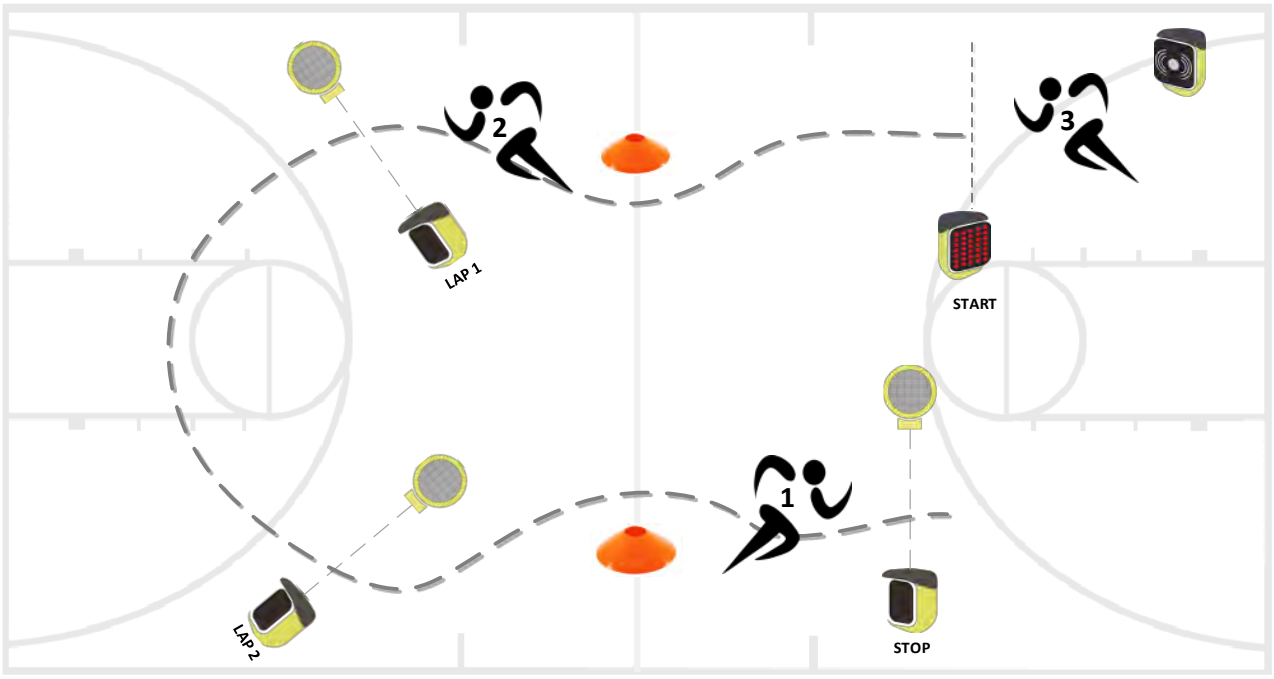
As soon as green appears, Witty·SEM launches a start impulse via radio and starts the timer

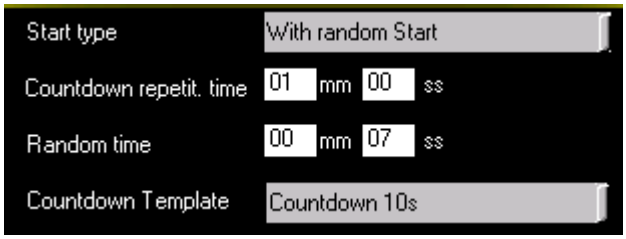


…afterwards, it waits 22 seconds (30 – 3 for the countdown – 5 for green) and restarts the cycle.

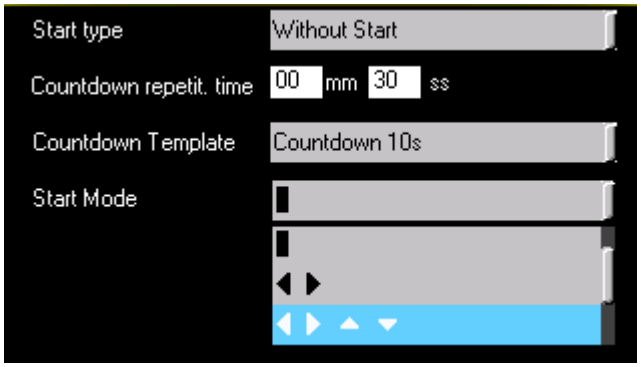
ATTENTION: If within the 30 seconds defined in the countdown repetition time the current athlete has not yet arrived, the next automatic START provided by Witty·SEM will be interpreted as the STOP of the previous athlete. Therefore, repeat a repetition time that is greater than the test time (with a certain safety margin).

Example 3: Start every minute, with a 10 second countdown, with generation of a random start from 0 to 7 seconds after the end of the countdown. In this case, the type of test is MultiStart (see chap4.2) and the athletes go to the start after scanning their bracelet with Witty·RFID (see chap 2.6)





The parameter **Start mode** can be used to display a different signal from standard as the “start” semaphore signal where all the LEDS (green) turn on.



The parameter values possible are:

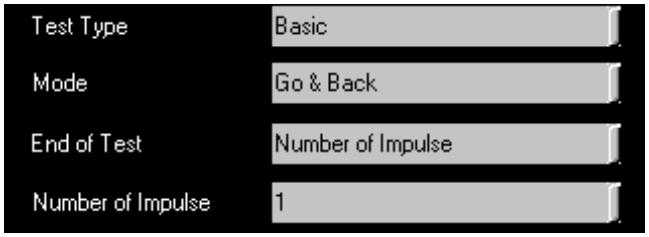
▮	all LEDs on (default)
◄►	right/left arrow
◄►▲▼	right/left/up/down arrow
A B	letter A or B
A B C	letter A or B or C

This way, before starting, the athlete can be assigned a “task” according to the symbol that appears by chance (e.g. “*when the semaphore comes on the athlete starts, but sprints from right to left depending on the arrow*”, or “*when the semaphore comes on the athlete starts, but if A appears he/she does a certain exercise, if B appears, he/she does another*”, etc.)

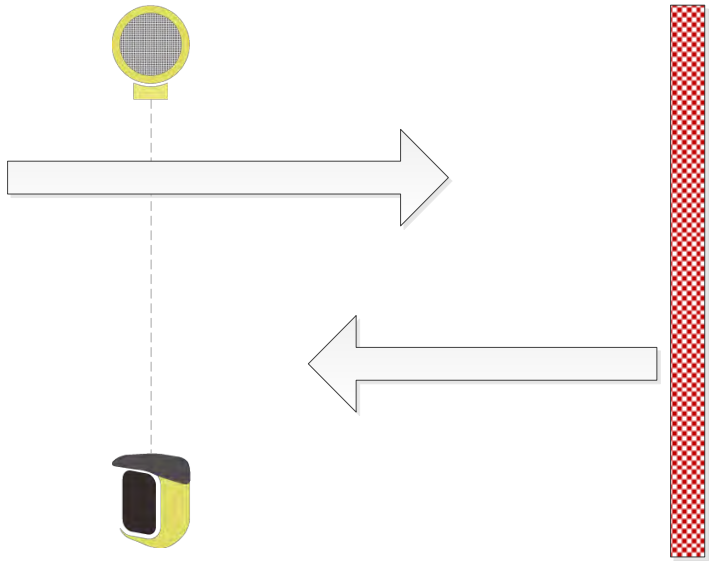
4.1.2 Go & Back

The Go & Back test type is basically similar to the In-Line test, but is designed for a specific test type with only one photocell.

For example: place the photocell (which will be used as Start and Stop) at a certain distance from the wall and define the test as follows:



The athlete starts, crosses the photocell (which starts timing), touches the wall and crosses the same photocell again, which stops the time.

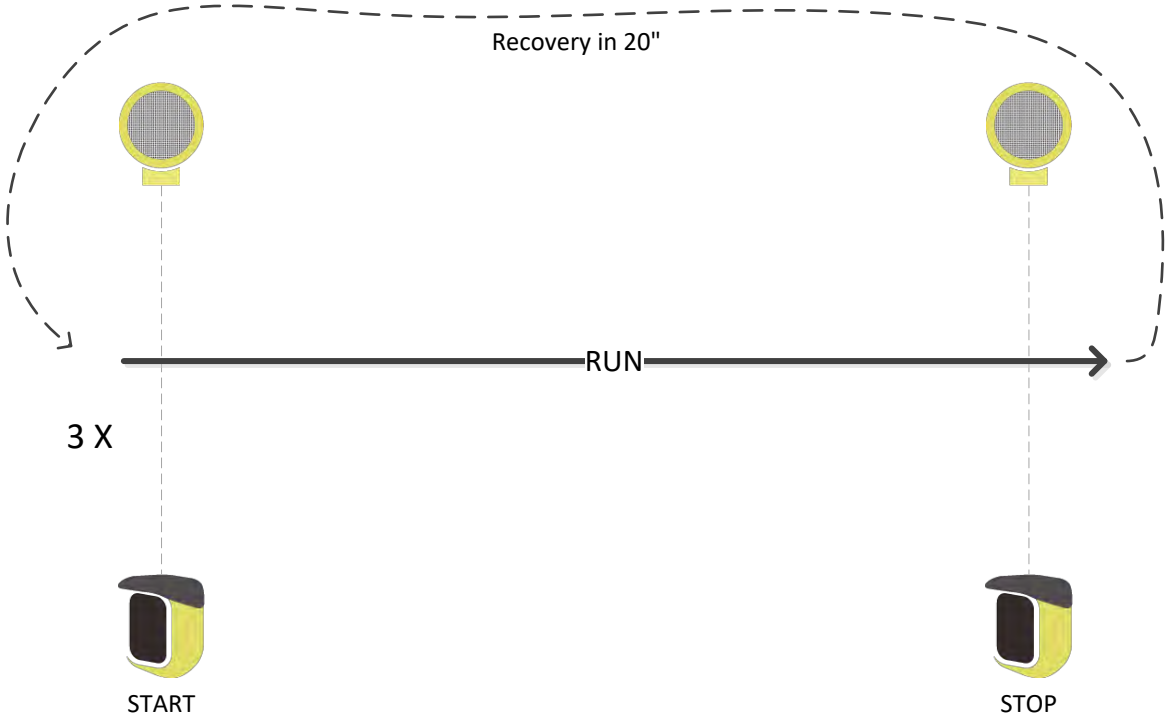


Of course it is possible to complete various 'laps' simply by increasing the number of impulses. Similarly to the previous chapter several go&back exercises can be created with a maximum time or by matching maximum time / number of impulses.

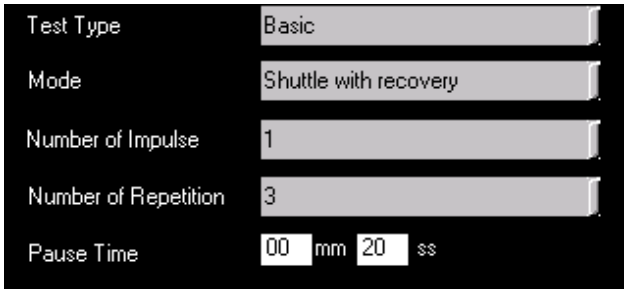
4.1.3 Shuttle with Recovery

The Shuttle test (with or without recovery) allows to execute shuttle tests, where an exercise is carried out a certain amount of times with a given number of seconds for recovery between them.

e.g. **50-meter sprint to be performed 3 times with 20" recovery between one sprint and the other**.



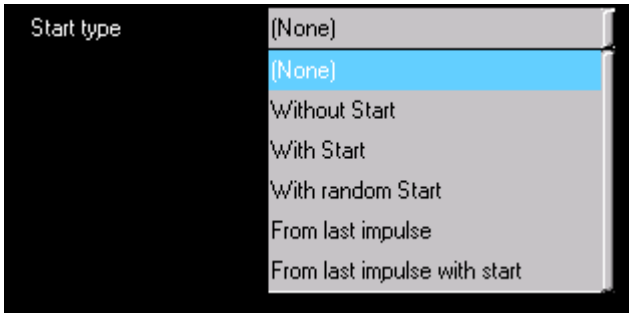
The test is set as follows:



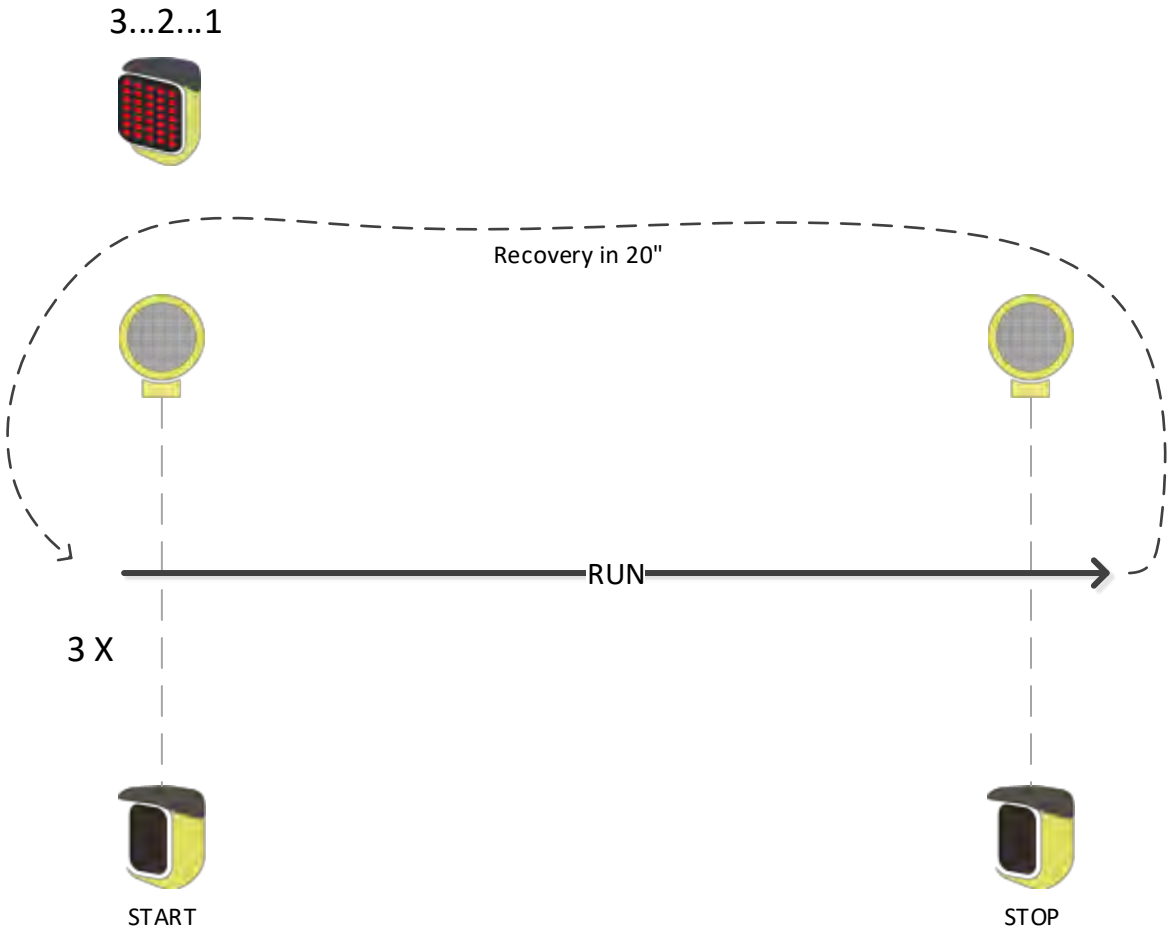
See chap. 5.1.2.4 for a timing example.

4.1.3.1 Enabling Witty·SEM

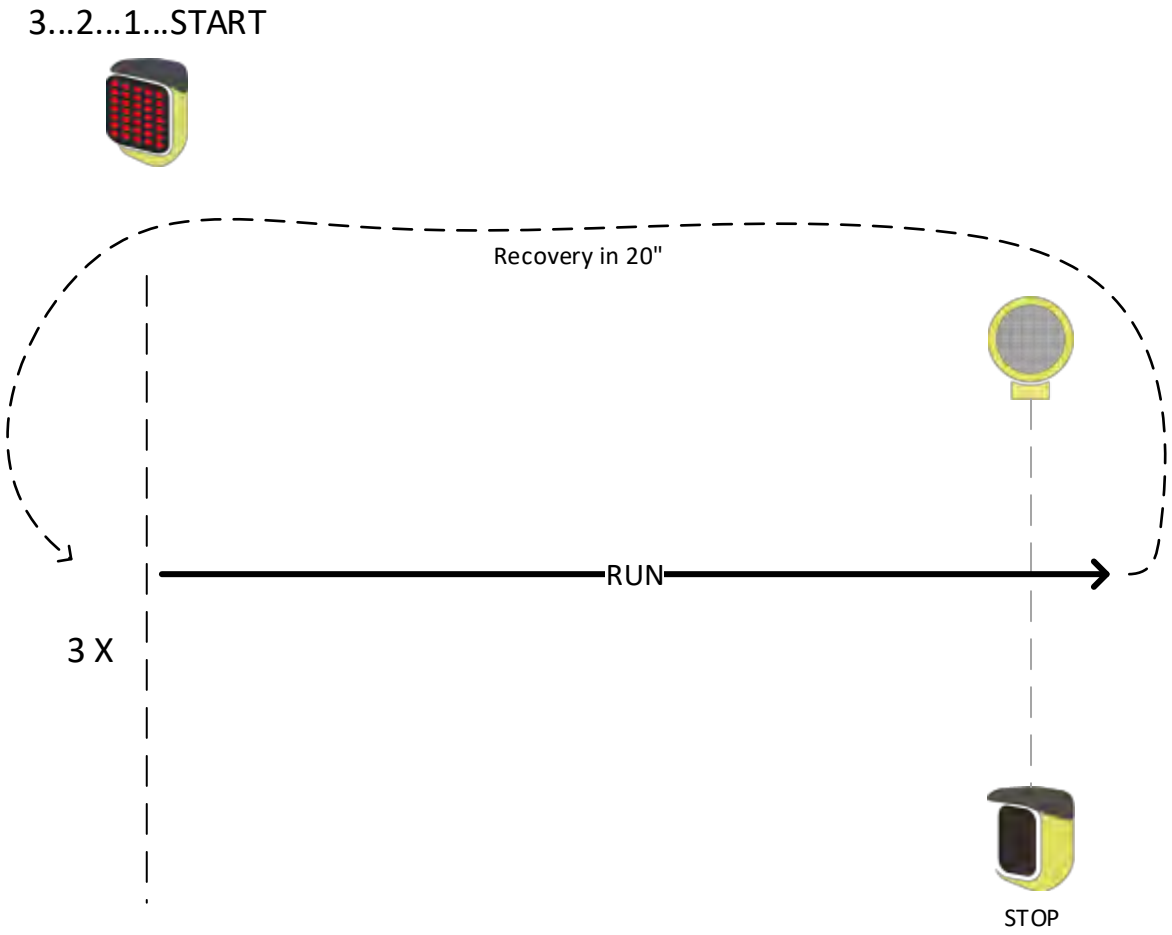
If Witty·SEM is enabled to be used as a start traffic light, there will be two additional options for Type of start



"From the last impulse", start the selected countdown (3s,5s,10s) after the athlete triggered the last impulse of each individual repetition (the stop photocell in the figure). Always remember to press <F1> Start Sem light at the beginning of the test.

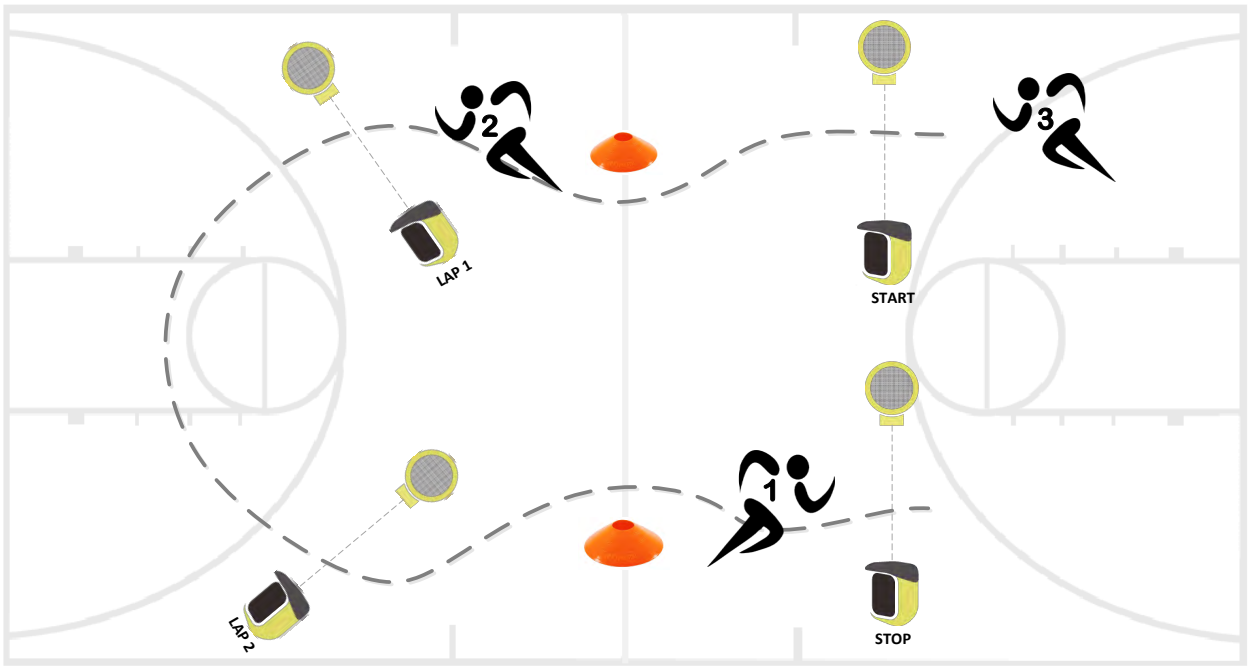


“From the last impulse with start”, when pressing Start traffic light and after the selected countdown (3s,5s,10s), a start impulse is transmitted to the timer. This is useful when only one photocell is available that is used for the stop



4.2 MULTISTART

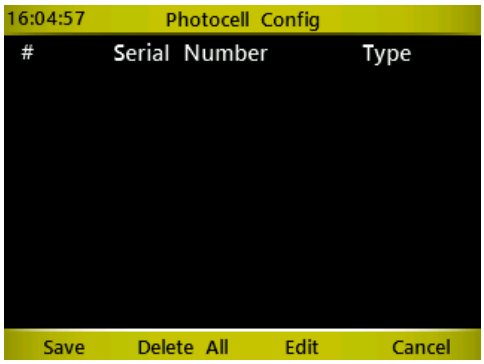
The MultiStart test allows to time circuits or courses carried out by several athletes at the same time (max. 3) from the start line to the finish line. The athletes must NOT start simultaneously (otherwise it would be impossible to associate events to bibs) but must start one after the other and in sequence. Even though, as we will see, it is possible to manage cases where one athlete passes another athlete, we suggest that you distance the athlete starts in order to prevent this. If a certain sequence of events connected to impulses is maintained (athlete 1 start-lap, athlete2 start-lap, etc.), it is much easier to manage the test.



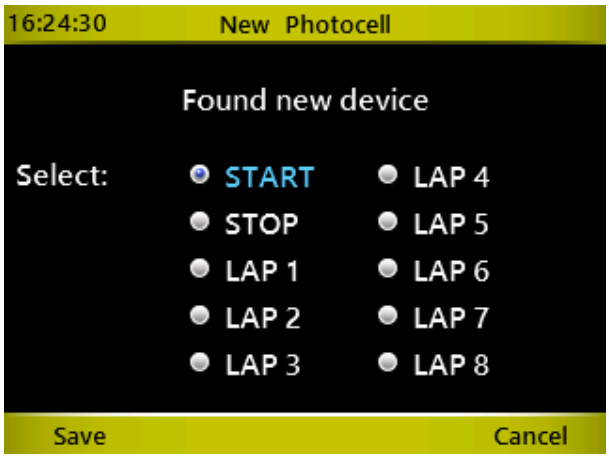
4.2.1 Configuring the Photocells

While for other test types (Basic and Counter) the photocells are set in the same way (start), in MultiStart tests they must be identified and assigned (i.e. set which photocells are start, which are stop and which are lap-n). This assignment can be carried out when defining the test (it is advisable to mark the photocells with a piece of tape or a label for the following test sessions) or directly from the timing screen using the Options key.

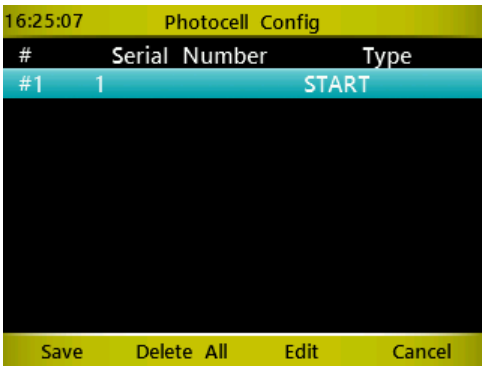
Create a MultiStart test as described in chap. 5.1.4. From test configuration, click on Options > Photocell Config, where an empty list is displayed:



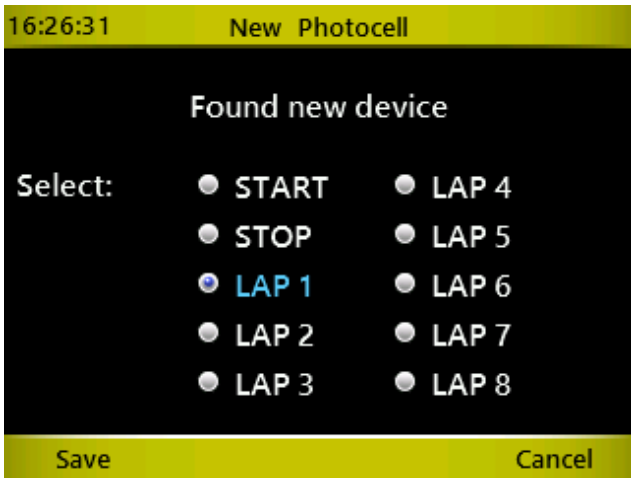
Assignment is very easy and consists of interrupting the photocell (having a unique serial number) with one hand and defining the required event type:

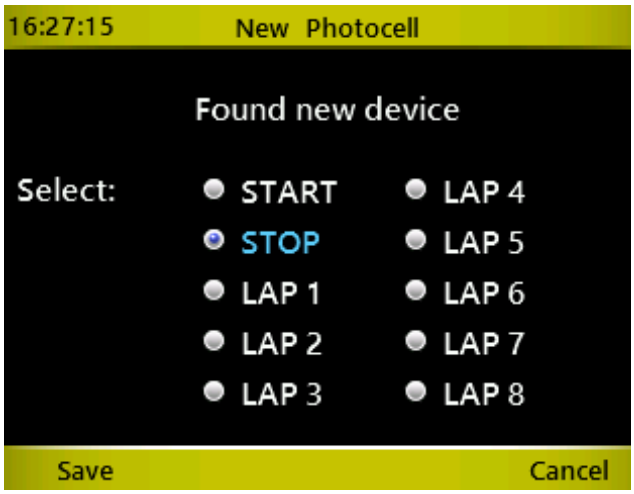


Scroll with the <*up*> and <*down*> arrow keys and select the event by pressing <*OK*>, then select <*F1*> to save. In the following example the photocell with the serial number 1 is associated to the START event.

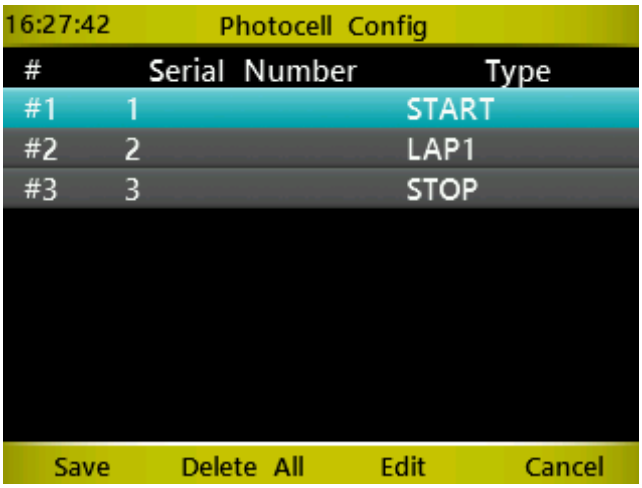


Repeat the operation with the other available photocells (at least the stop photocell):





after which the situation will be the following (with more or less LAP photocells depending on how many are available):

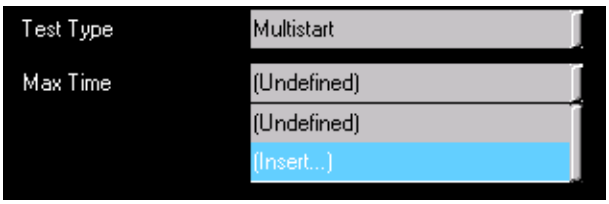


Press <*F1*> to save the configuration! (By pressing <*F4*> or <*Microgate*> the previous screen is closed without saving, thus all entered data will be lost).

To change the event type associated to a photocell, go to the line (light blue color) of the required photocell and press <*F3*>. Similarly to the first photocell, choose the event type and save by pressing <*F1*>.

It is not possible to delete a single assignment, but only to reset the configuration (<*F2*> key) to begin a new assignment.

By closing the Test configuration screen it is possible to set a Max Time for completing the circuit/course. The field can be left undefined or you can set a value in minutes:seconds.



4.3 COUNTER

The Counter test type counts a given number of actions/exercises or checks how long it takes to complete an exercise consisting of a certain number of repetitions.

The End of Test parameter can be defined as follows:

Number of Impulses: Choosing a number of impulses (e.g. 5) the test will be completed when the timer receives a number of events equal to the entered value, including the first Start event (not like in the Basic test type, where it is excluded).

End of Time Setting a time in minutes:seconds, the complete test will finish when the set amount of time is reached**.**

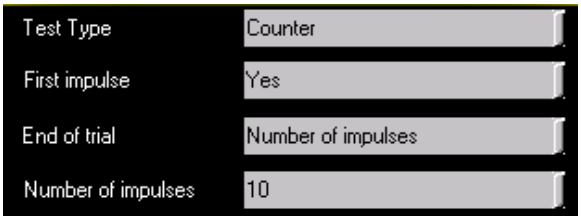
Timeout Setting a time in minutes:seconds, the test ends when the 'repetitions' are carried out in an amount of time that is higher than the one set.

It is furthermore possible to indicate if the **First Impulse** is to be included in the timing or not.

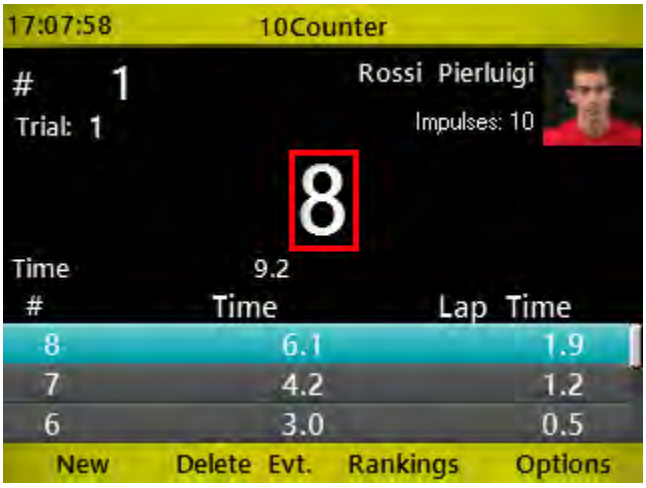
Let's see some examples:

Example 1. Timing of how much time it takes to do 10 push-ups.

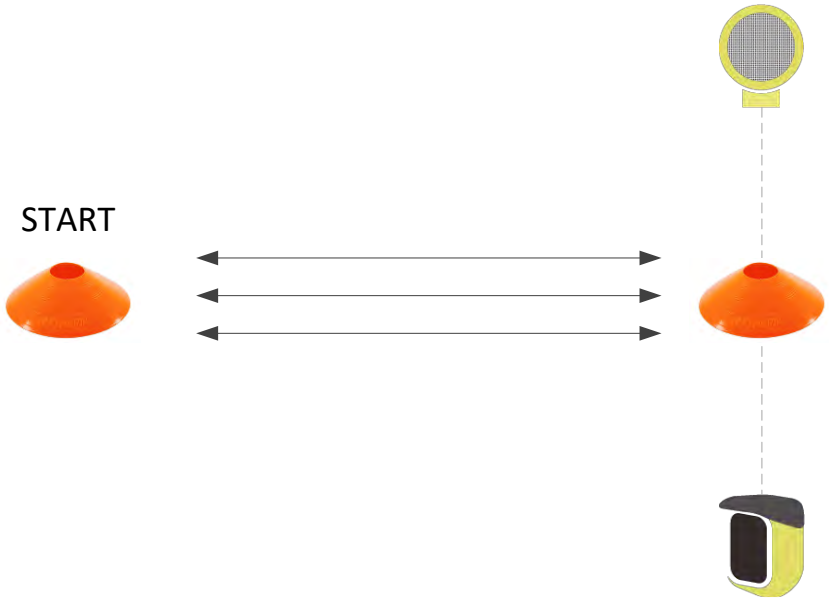
Set the test with End of Test=Number of Impulses and as parameter the desired number of push-ups:

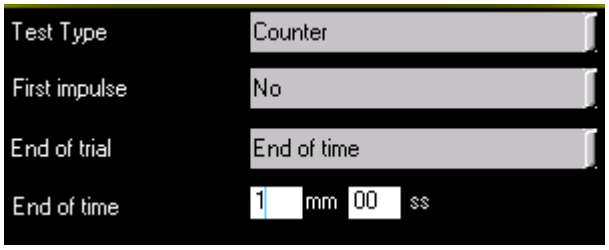


While timing, the main parameter showing is the counter. In the table, for each repetition the progressive time and the amount of time of the single repetition is displayed.

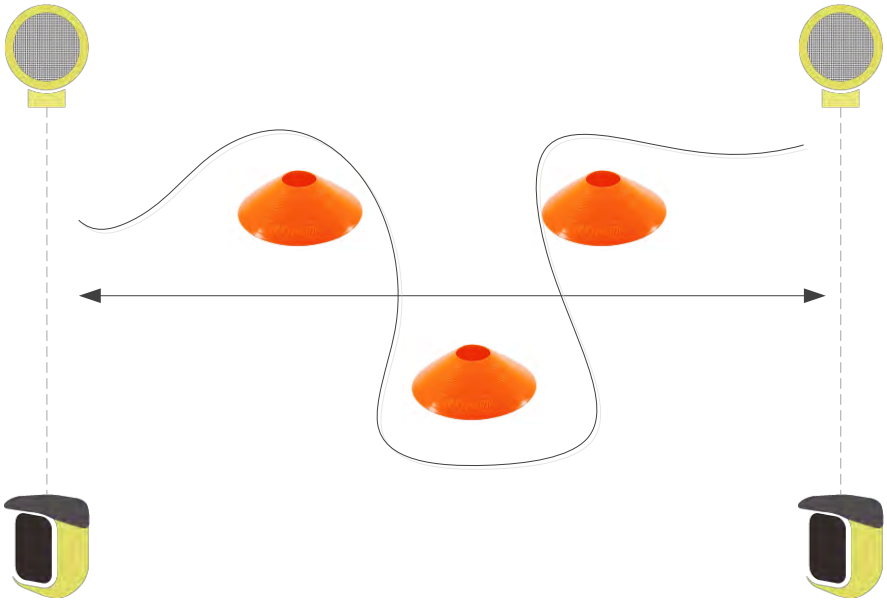


Example 2. Test for one minute and check how many times the action is performed during the total amount of time (e.g. go and back from two positions crossing a photocell). The winner is the one who has totaled more impulses within the maximum time (and in case of same number of impulses, within the shortest amount of time). The first start impulse (starting from far away) is not counted.



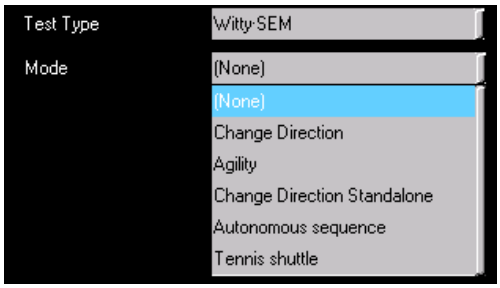


Example 3. A certain repetitive action must be carried out within 30 seconds (e.g. slalom through cones or a series of jumps). If the repetition takes longer than the set time, the test is stopped. The winner is the athlete performing the highest number of repetitions.



4.4 WITTY·SEM

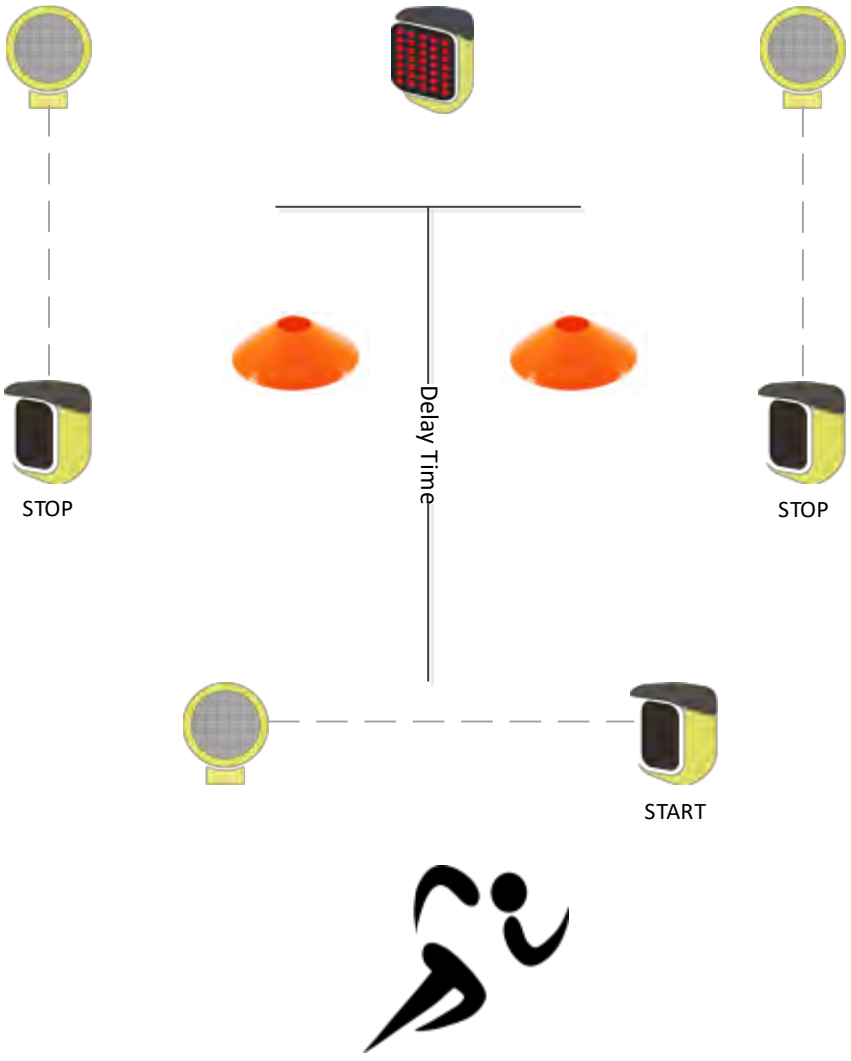
There are various categories of "Witty·SEM" tests:



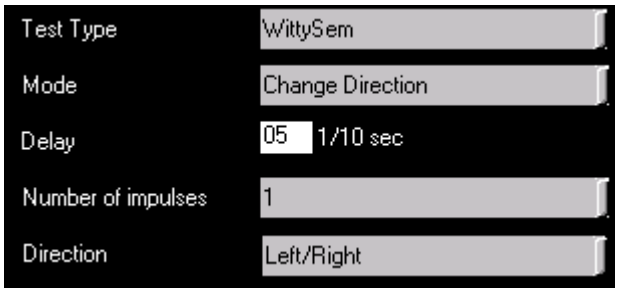
4.4.1 Change Direction

The Witty·SEM/Change Direction type of tests are used to perform exercises in which the traffic light has the athlete change direction randomly (right, left, forwards, backwards) using the arrow symbols.

Example 1: this could be a variant of the classic T-test, where the athlete starts off, crosses a Start photocell, runs a few metres and the traffic light indicates (randomly) to sprint to the right or to the left;



To carry out this type of exercise, set the test as follows



Delay: Insert the delay in tenths of a second, after which Witty·SEM turns on the direction change arrow. The parameter is set, calculating approx. the time the athlete takes from the last impulse before the traffic light to the direction change point.

Number of impulses Number of impulses after which Witty·SEM displays the arrow. In example 1 it is set to 1 (start photocell before the traffic light); in example 2 below, it is set to 2 (start + lap1).

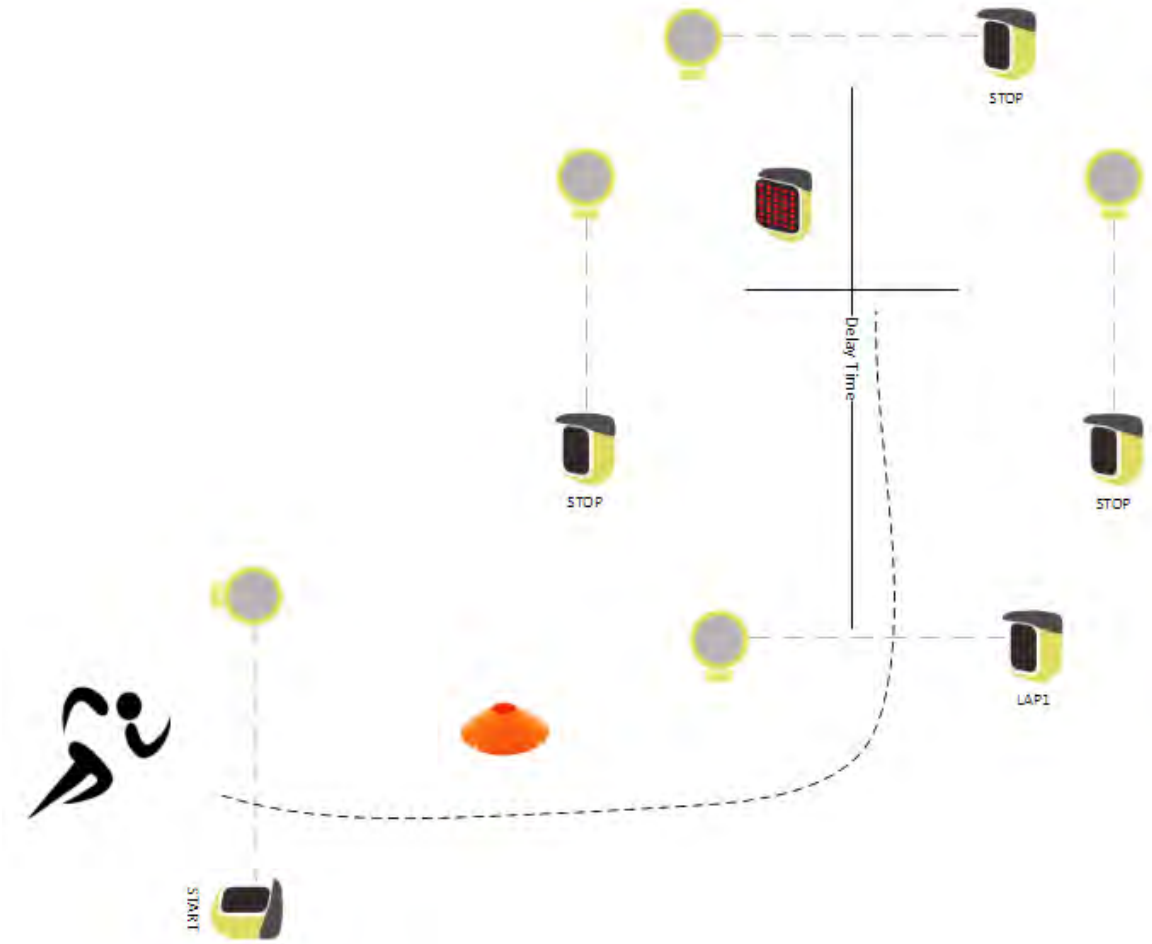
Direction This indicates the directions Witty·SEM displays; the possible selections are left/right, left/right/forwards, left/right/forwards/backwards

Number of Repetitions Indicates how many times the sequence “break photocell + turn on semaphore” occurs. It is useful to create a number of Gate/Sem “groups”, see example 3.

The sequence takes place as follows:

Witty·SEM off– start impulse – half a second wait (5 tenths) – appearance of the right or left arrow – stop impulse – Witty·SEM indicates its index (A,B,C). Pressing *<F1>* New, the sequence restarts.

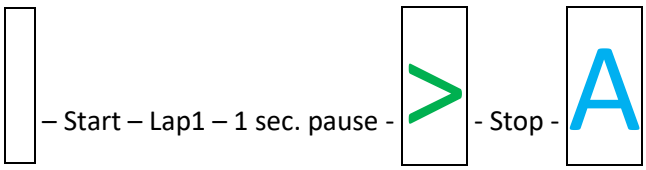
Example 2: The athlete starts, triggers the start photocell, does a lap, after n tenths of a delay, Witty·SEM indicates to the athlete to go to the right, left or straight. The stop photocells stop the time.



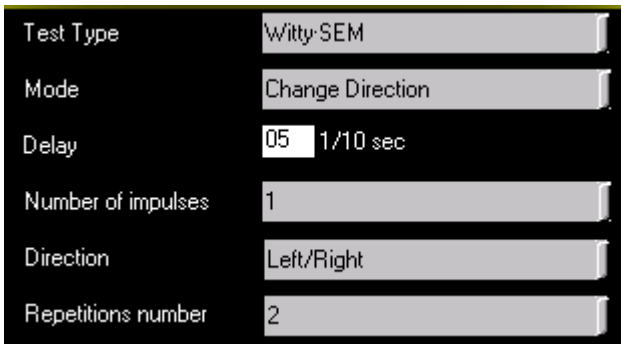
The test is defined as follows:

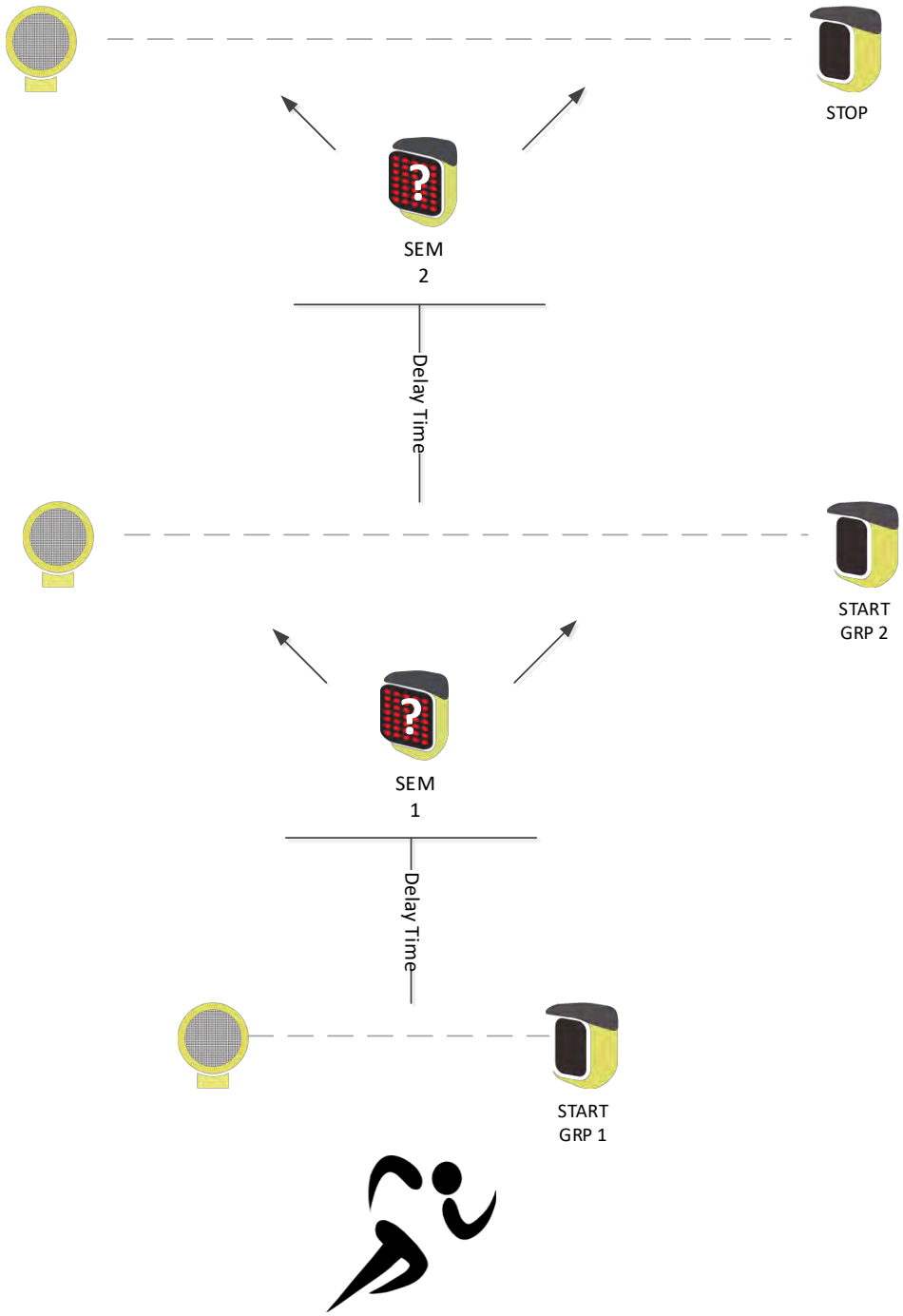
Test Type	WittySem
Mode	Change Direction
Delay	10 1/10 sec
Number of impulses	2
Direction	Left/Right/Forward

The sequence will be:



Example 3: Exercise with 2 “groups” of Gate/Sem: Set the number of repetitions to 2 and the number of pulses to N after which you want to access the semaphore with the direction change

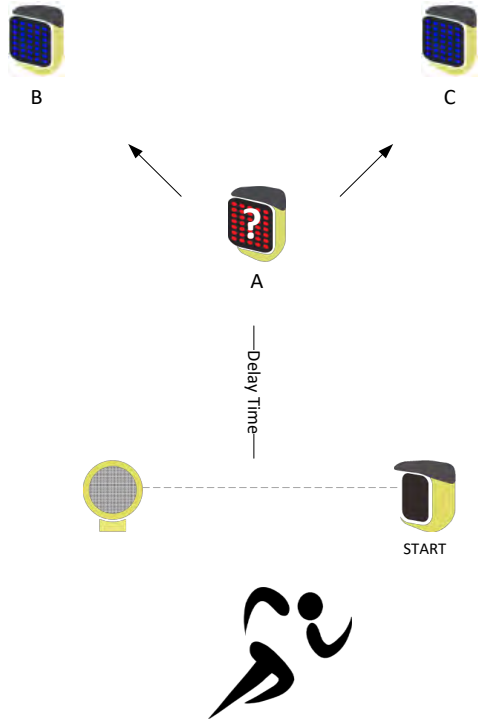




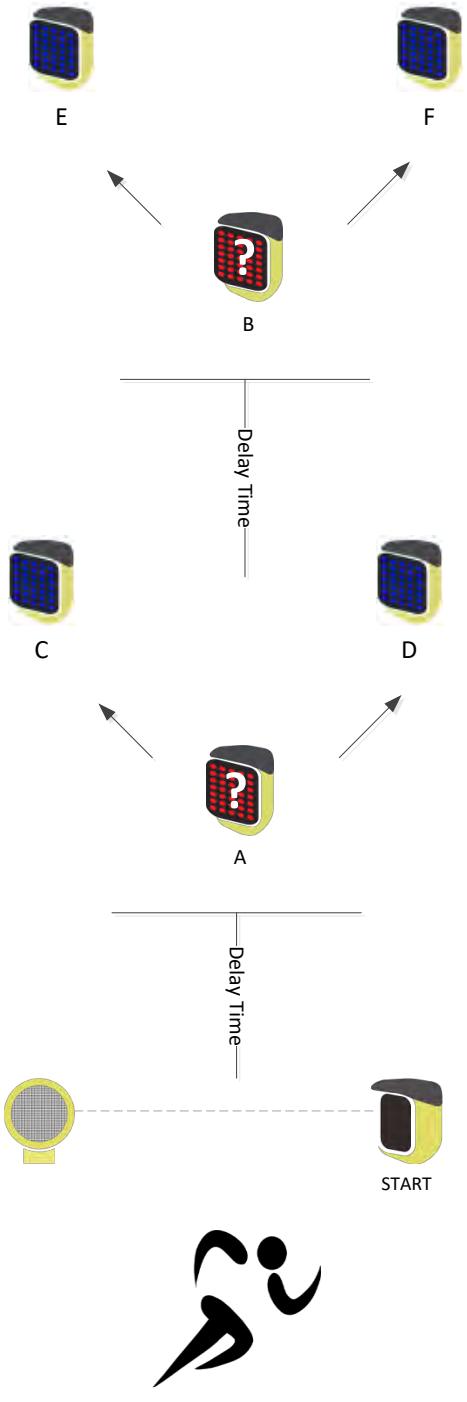
Starting from the WittySEM 2.0.4. firmware version, the traffic lights can be used instead of the photocells by placing them AFTER the traffic light that serves as a Direction Change in order to finish the test (instead of crossing the photocell beam, bring your hand close to the traffic light).

Example: The A Index traffic light displays the arrow of the direction chosen, whereas the B and C traffic lights turn Blue and one of the two must be "off" when bringing your hand close to it to finish the test.

If we have several traffic lights that serve as Direction Change (and therefore Number of Repetitions >; 1), the first are for selection and the others act as a photocell.



No. of Repetitions = 1

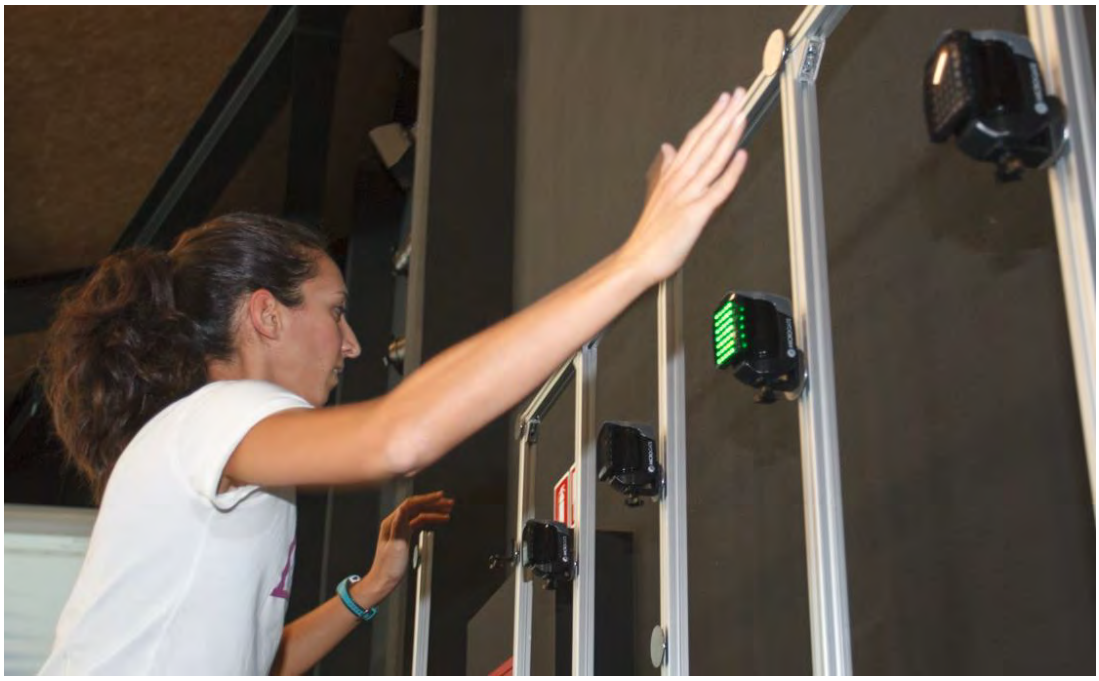


No. of Repetitions = 2

4.4.2 Agility

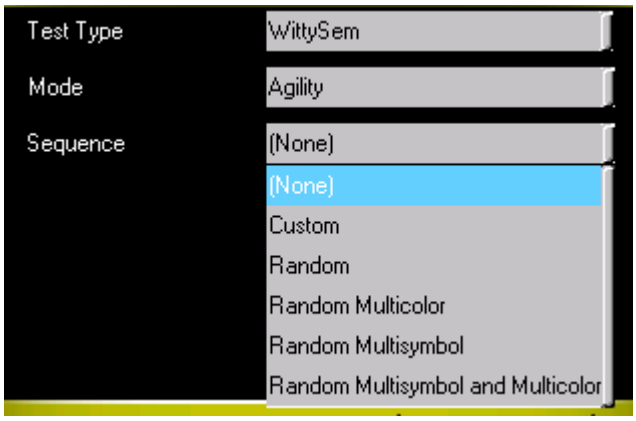
With this type of test, the Witty + Witty·SEM system becomes a tool to have the athlete perform speed & agility exercises, where the objective is to “turn off” the traffic light by approaching the proximity sensor with a hand (or foot, a racquet or other body parts).

It is obvious that multiple Witty·SEM traffic lights must be used that, after receiving the test parameters, will turn on/off according to a sequence pre-set by the user or randomly depending on the mode. The traffic lights can be positioned differently (on tripods, on magnetic supports, on suction cups on the ground, etc.) depending on the selected exercise.



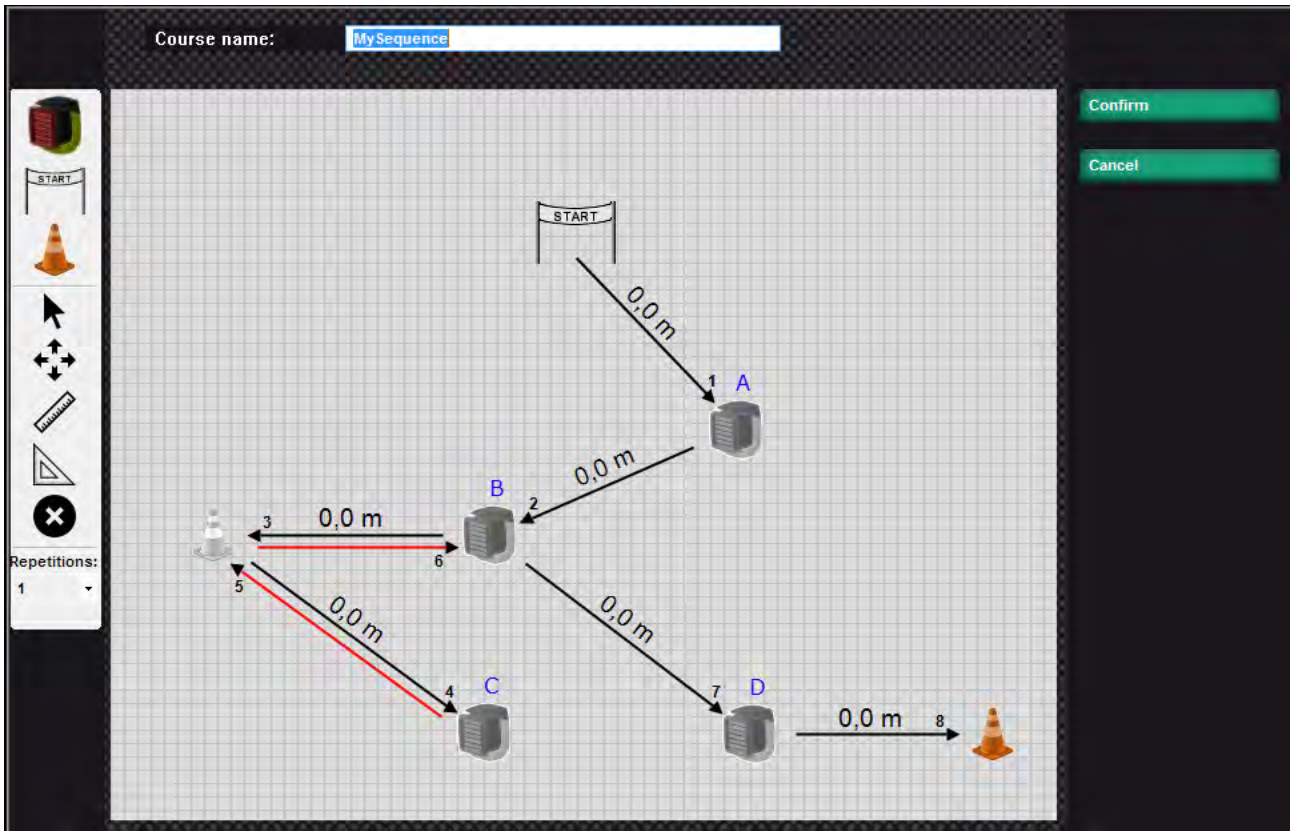
If you do not want the athlete to come near the traffic light but rather trigger the passage through a “gate”, it is possible to combine a photocells with a traffic light using a C-bracket and connecting them to a cable (the same way as with a double photocell, see chap. 2.2.3).

The Agility tests can have a different type of sequence as indicated below:

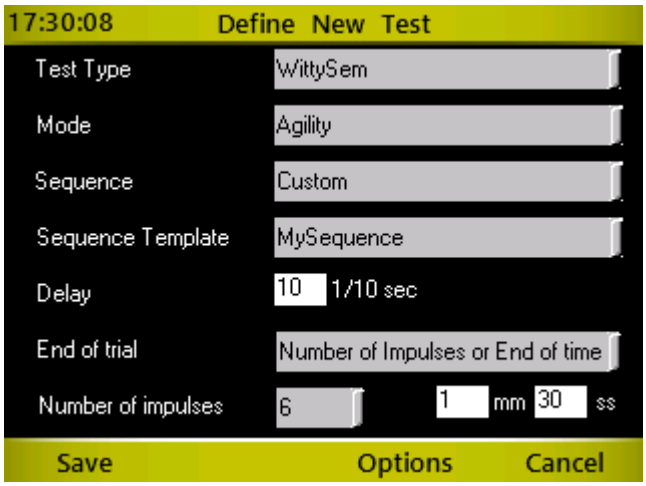


4.4.2.1 Custom

The Sequence (route) to follow is designed using the Witty Manager software and given a name as preferred (MySequence in the example). The same name is selected in the Sequence Template field.



Refer to the software manual for details about how to design the sequence.



The following fields are the same for all types of sequences:

Sequence template: Select one of the customised templates created with Witty Manager

Delay: Delay in tenths of a second between the turning off of a traffic light and the turning on of the next one

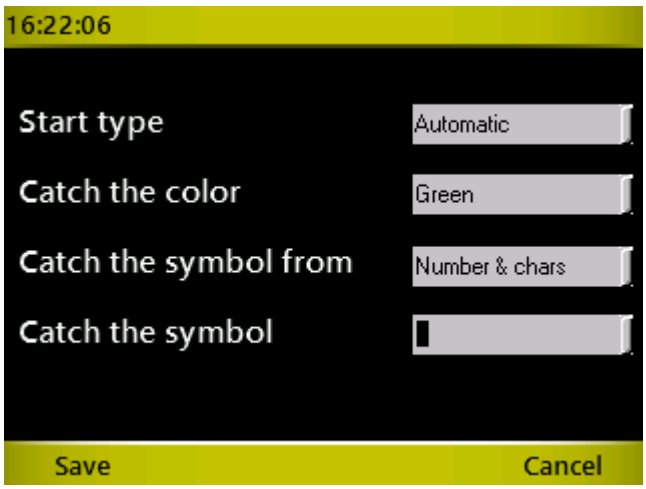
End of test This indicates the way the test ends, it can be

Number of Impulses: Choosing a finite number of impulses (e.g. 5) the test will be completed when the timer receives a number of events (traffic light "off" operations) equal to the set parameter. The parameter is calculated automatically in the case of customised sequences.

End of Time Setting a time in minutes:seconds, the test will finish when the set amount of time is reached**.**

No. of Impulses or End of Time Setting both parameters, the test ends when the first of the two conditions is reached.

Pressing the key <*F3*> Options and selecting the Witty·SEM icon makes it possible to select the start type, the colour, type of symbol and the symbol/character/number to follow. The default setting is always the green block (rectangle), but it is possible to have an athlete follow a letter (lower case or upper case) or a number with one of the three available colours

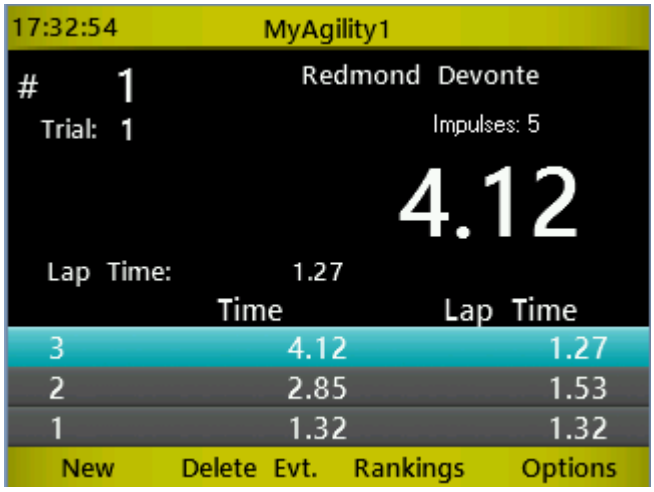


Start Type:	**Automatic (default):** the test start automatically **From Witty·GATE**: the test starts after a countdown 3..2..1 and after a photocell beam is broken
Catch the colour:	Select one of the 3 available colours; green, red, blue
Catch the symbol from:	Numbers and characters (▓, 0…9, a…e) Characters only (▓, A…O)
Catch the symbol	The block, the letter or the number depending on the selected set

The test starts with a 3 second countdown and then turns on the first traffic light that the athlete must turn off.

As soon as it is turned off via the proximity sensor or by obscuring the connected photocell, it turns on the next one (with a possible set delay of n tenths of a second).

The timer detects the OFF condition via the intermediate times

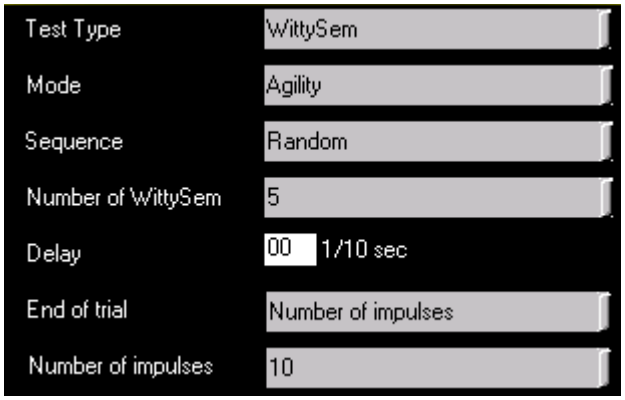


If a route was created that also indicated the distances, also the speeds are displayed.

It is very important to adjust the proximity sensor threshold in accordance with how the test should be carried out; if the athlete must get very close to the traffic light (almost touching it) set the threshold to "close", otherwise "average" or "distant" should be sufficient (see chap. 5.4.7)

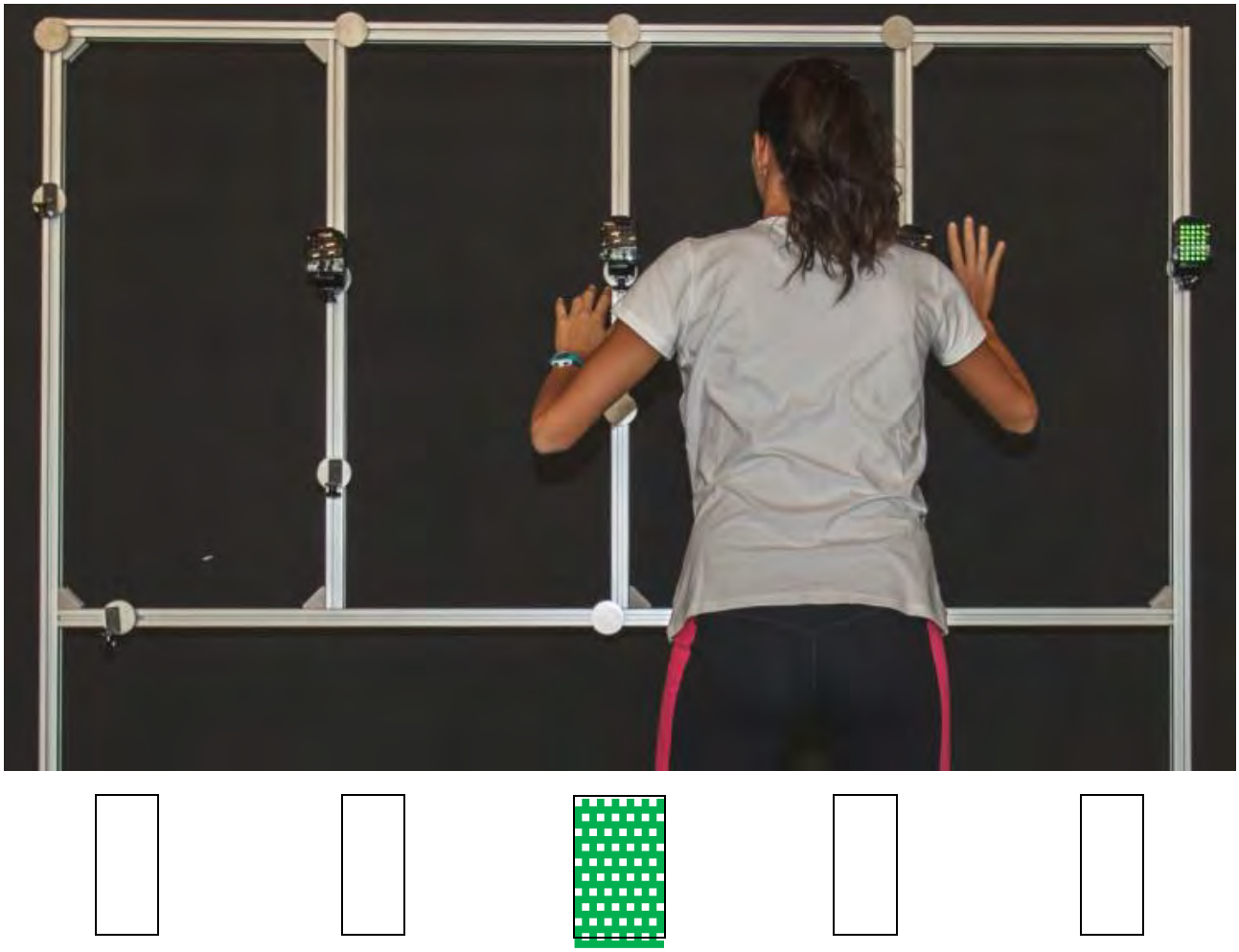
4.4.2.2 Random

With this type of sequence, only one of the N traffic lights turns on with the selected symbol/colour, all the others remain off.



The only parameter that is different than the previous one is how many traffic lights that are used (in the customised sequences, it is automatically taken from the selected template)

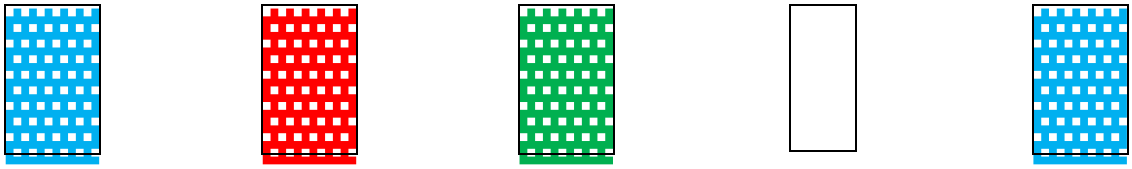
Number of Witty·SEM: Indicate how many Witty·SEM are available



Catch this !

4.4.2.3 Random multicolour

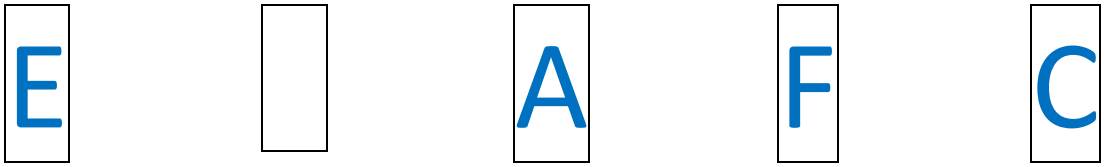
The colour to be followed is defined (e.g. ▓ red); the other traffic lights display nothing, or the same symbol but in a different colour



Catch this !

4.4.2.4 Random multisymbol

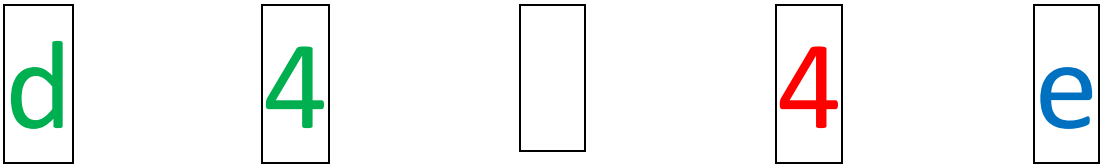
The symbol to be followed is defined (e.g. **F** blue); the other traffic lights display nothing, or other symbols in the same set, but always in the same colour



Catch this !

4.4.2.5 Random multisymbol and multicolour

The symbol and colour to be followed is defined (e.g. **4** green); the other traffic lights will display nothing or other combinations of symbols and colours different than the one selected.

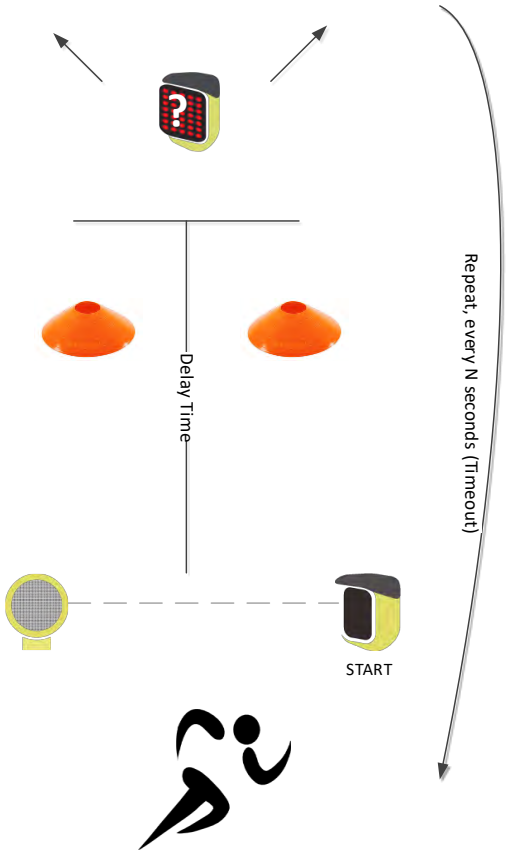


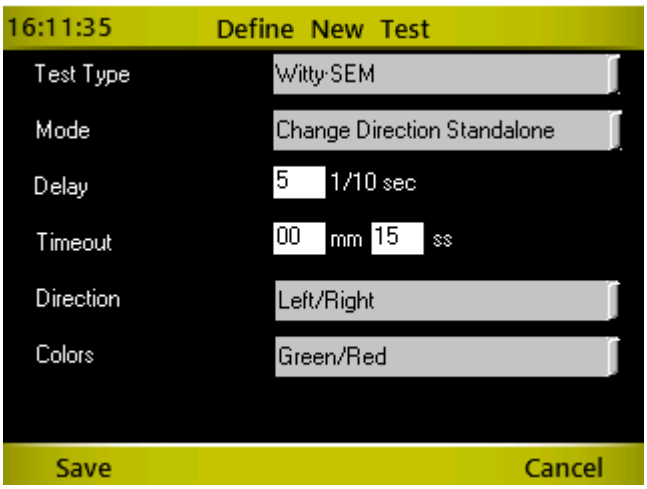
Catch this !

4.4.3 Standalone Change Direction

The “Standalone Change Direction” test differs from its predecessor because it does not use the timer, except to begin the test. Once the test has begun, it can continue uninterruptedly without further intervention. Obviously NO DATA IS RECORDED, as it is simply a *working-tool* for one or more athletes to use.

Example 1: using the Start photocell, the athlete runs a few meters (the interval Time is set to this distance) and the semaphore randomly indicates whether to sprint to the right or the left; the semaphore remains on for N seconds (set Timeout time), then it turns off and is ready for the next athlete or another repetition by the same athlete. In the meantime, the timer displays only information that is current for the test but receives no other pulse. Press <F1> or <Microgate> to exit from the menu.





Delay: Enter the delay in tenths of a second, after which Witty·SEM turns on the direction change arrow. The parameter is set, calculating approx. the time the athlete takes from the last pulse before the traffic light to the change direction point.

Timeout Enter the number of seconds according to which the semaphore turns off and is ready for a new test.

Direction This indicates the directions Witty·SEM displays; the possible selections are left/right, left/right/forwards, left/right/forwards/backwards

Colours The possible choices are Green, Green/Red, Green/Red/Blue. Using an option with two or three colours, the semaphore comes on randomly with one of these colours; it is possible to use this additional random

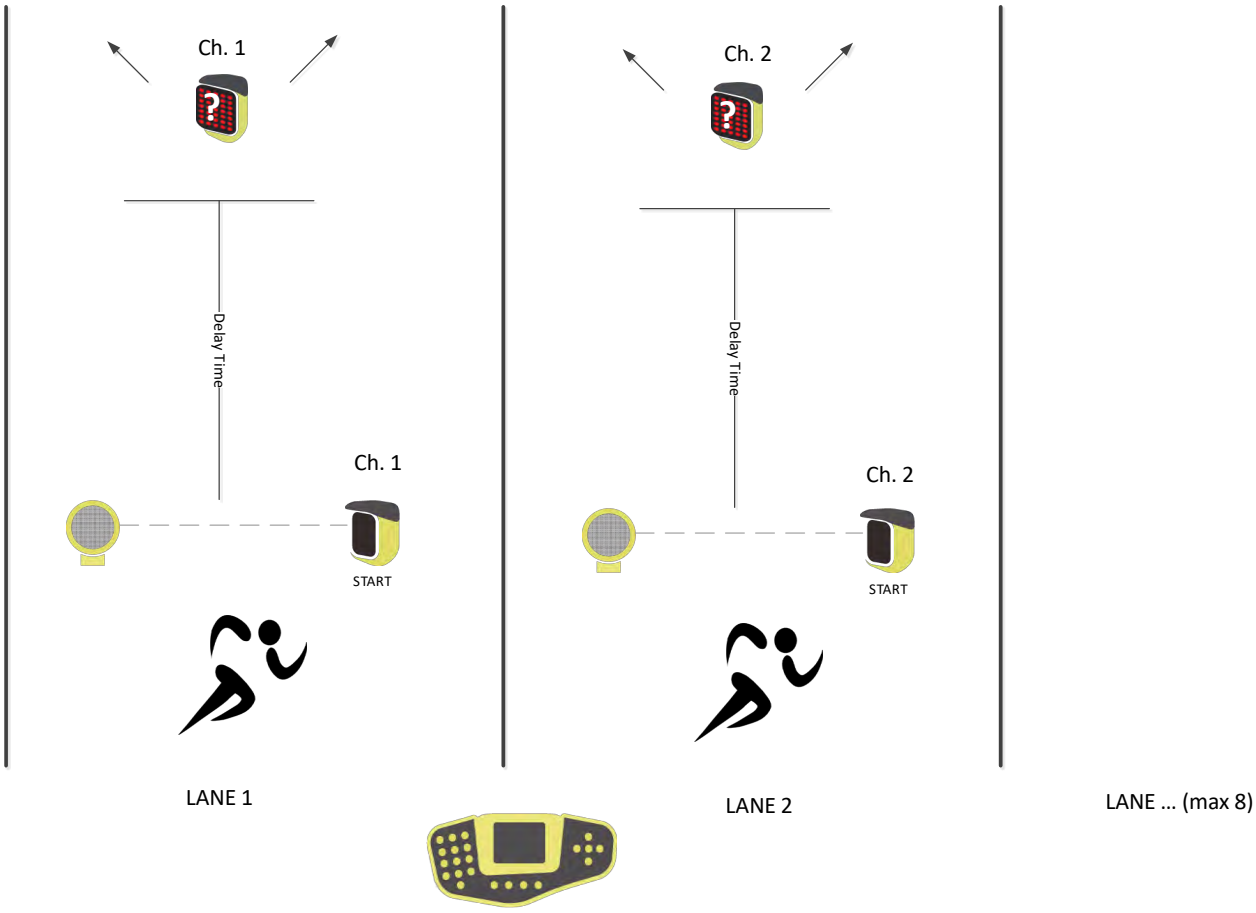
function also to direct cognitive type exercises (e.g. "*if the arrow is green, athletes must follow that direction, if it is red, they have to go in the opposite direction to the one indicated*")

The sequence happens as follows:

Witty·SEM Off – Start Pulse – Standby for half a second (5 tenths) – The right or left arrow appears (in green or red) – Standby for 15 seconds (e.g. recovery time) – Ready for a new signal

Another possible application for this type of test is the application of a more than one photocell/semaphore pair set on different channels to use on more than one course or in the exercise space, using A SINGLE timer.

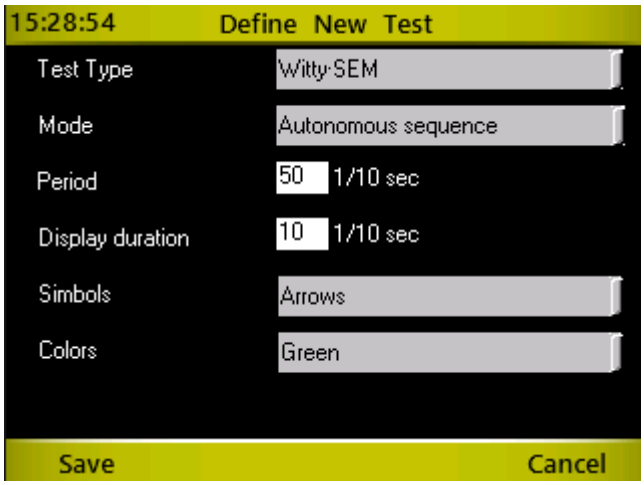
It is in fact possible to set the first pair on a channel, e.g. channel 1, and start the test. Then the channel can be changed to the second pair to launch, and so on. Given that the timer is not needed to carry out the test, once it has begun it continues autonomously. Remember to set the timer (see chap.5.4.1.2) on the channel of the pair for the course you want to start.

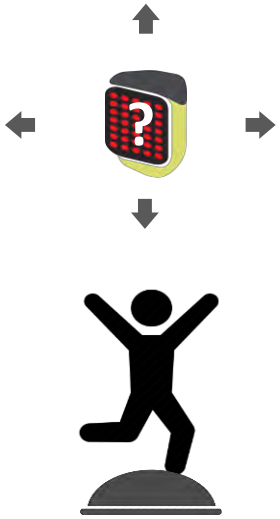


4.4.4 Autonomous Sequence

The purpose of the test is to turn on a symbol (e.g. an arrow) on the traffic light within a defined period of time. Generally, only one traffic light is used in order to make the athlete perform specific actions according to the symbol displayed. If several colours are used, the difficulty can be increased by providing other tasks (e.g. *if the arrow is green, jump in that direction, if it is red jump on the opposite side*). The test continues endlessly until another type of test is chosen or the WittySEM are turned off.

Example 1: an athlete balancing on the Bosu Ball faces a WittySEM, which indicates whether to jump down from the equipment in the direction shown by the arrow.





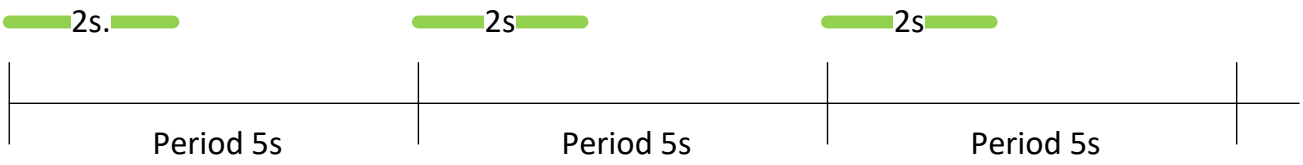
Period: Insert in tenths of a second the time during which the WittySEM turns on the chosen symbol

Display Duration Insert in tenths of a second the time the traffic light stays on in the set period

Symbols It indicates whether to use Arrows, Letters or Numbers

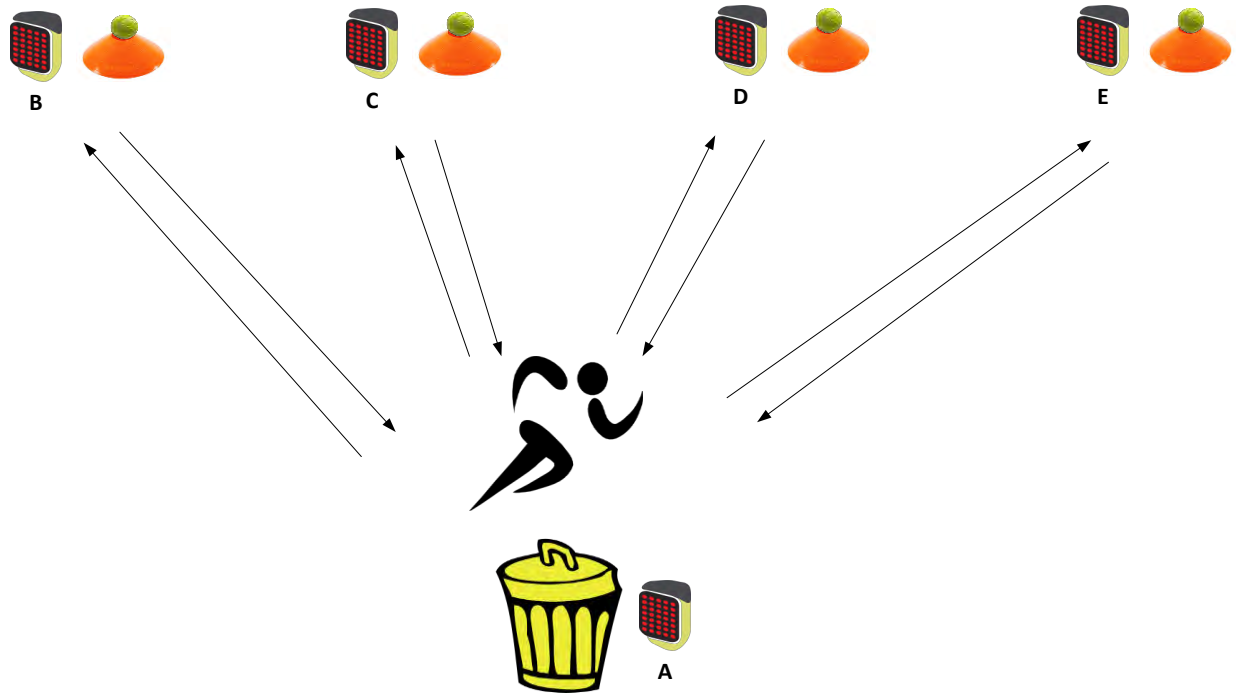
Colours It indicates whether to use only the colour Red, two colours (Red/Green) or three colours (Red/Green/Blue). In the case of several colours, the symbols will turn on randomly in one colour or the other.

By setting the period to 5 seconds (50 tenths) and the display period to 2 seconds, we will achieve this effect:



4.4.5 Tennis Shuttle

The name of this type of test is derived from a well-known exercise used in the tennis world, where 4 or more cones are positioned with a tennis ball on top, which athletes have to fetch and bring back using a bucket placed behind them.

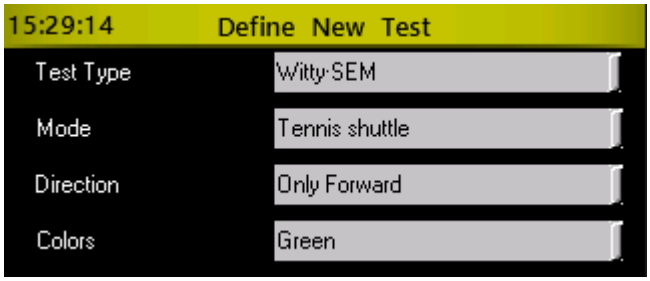


Of course, instead of using cones, tennis balls and a bucket, we will use the WittySEM traffic lights, which will have to be turned off by bringing a hand close to them. The first traffic light (the one that simulates the bin) is optional and can be replaced by a cone or another item, to which the athlete must return each time.

The traffic lights all come on (with the full-LED symbol and in the set colour) and, for this test, there is no need to follow a specific logic: the test will stop after N impulses (if Direction = Forwards Only) or (N*2) + 1 impulse (if Direction = Forwards/Backwards; +1 is the start one) with N=number of indicators.

Before starting the test, the Witty·TIMER scans the number of traffic lights present, therefore there is no need to indicate how many there are.

Example: simulate the exercise described above, in which the athlete must touch the start traffic light (A) and go to touch the B, C, D, E traffic lights in sequence, each time returning "to home base" by touching the A traffic light. In some cases, the athlete is asked to make a specific gesture that is different for each route (e.g. a jump from A-B, a push-up from A-C, a slalom from A-D, etc.).



Direction: Choose *Forwards Only* or *Forwards/Backwards*; in the first case, the traffic lights that will have to be "turned off" are the ones in front of the

athlete (e.g. B, C, D, E in the figure above), whereas by choosing Forwards/Backwards the start (A) traffic light must be switched off, otherwise for each touch the athlete will have to go back to touch the base one (B-A, C-A, D-A, etc.); the start traffic light at the base must always be the one with the **lowest letter index**.

Colours It indicates the colour (green, red or blue) shown

4.4.6 Cognitive Tests

Microgate has long been working together with the American company **Posit Science** to bring the suite of their cognitive tests called **BrainHQ** to WittySEM smart semaphores.

BrainHQ is in fact a brain training program built and tested by an international team of more than 100 neuroscientists and other experts in the field. The exercises, which are played out on a PC or tablet, are not “video games", but something (which has been demonstrated scientifically with magnetic resonance imaging of the brain and by more than 170 publications) able to train different cognitive skills.

This idea stems from the basic concept of **neuroplasticity**, recently introduced in neuroscience, which indicates the capacity of the brain and of the entire nervous system to change ("plasticity") and optimize its structure at any age, in response to a variety of intrinsic and extrinsic factors.

Microgate has taken six of these exercises and developed them to be executed on WittySEM semaphores, where in addition to cognitive capabilities it is possible to add a motor aspect: not only because in order to give the answer you need to use part of the body and not just the hand guiding the mouse, but also because the athletic trainer or physiotherapist can separate each answer with a specific movement.

A classic pattern for example is that of leaping (or making a well-defined movement) before going to "answer” the current test on the semaphore. Or of making a movement related to the sport or activity we are involved in (e.g. dribbling a basketball, loading a weapon, etc.)

This is why we have coined the term "**Cognition in Motion**"… because the movement-thought combination is something you can train and improve!

The 6 tests we have chosen stem from 3 main categories targeted specifically at training different cognitive skills.

ATTENTION

Each of our attention exercises has been created to stimulate the brain’s ability to focus.

- **01 Divided Attention**
- **02 Double Decision**
- **03 Mixed Signals**

SPEED (BRAIN SPEED)

The speed with which the brain is able to analyze events determines the effectiveness of the reaction and the ability to remember them.

- **04 Hawk Eye**
- **05 Eye for Detail**

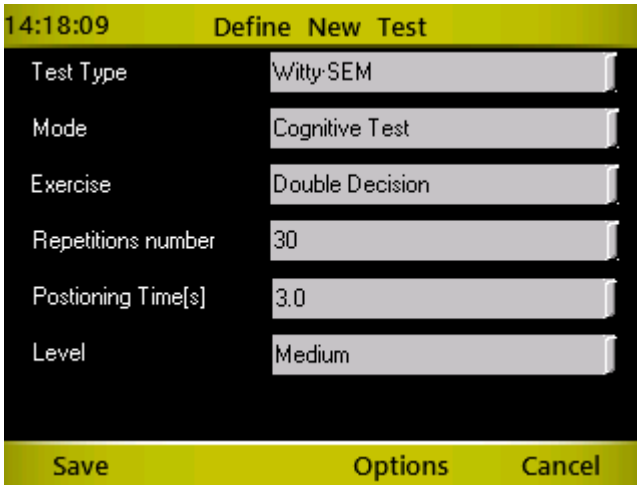
INTELLIGENCE

The ability to govern complex reasoning requires quickly and simultaneously managing different pieces of information.

- **06 Juggle**

Common Parameters

There are a number of parameters that are common to all the tests and are going to be described here, avoiding doing it on a case-by-case basis.

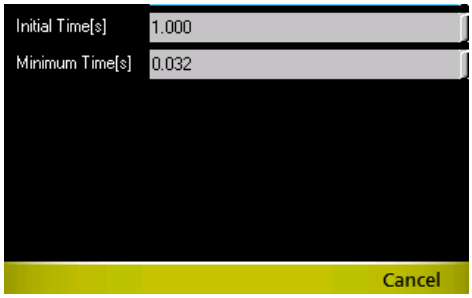


Repetitions Number: This is the number of times that the proposed exercise will have to be executed

Positioning Time This is the time that we want to give our user to go back into the starting position (usually in front of the Witty Frame or the tripods) ready to switch off the next semaphore. If we have given an “accessory movement" between one exercise and the next (jump, juggle, specific action), then this parameter will be increased accordingly. The default is 3 seconds.

Level Every test has a set of parameters that, when combined together, can give rise to an infinite number of variations. To simplify management, we have decided on **5 pre-set levels** for each test, according to our experience, in order of difficulty (*very easy, easy, medium, hard, very hard*). The level named "*Custom*" is however always available where you decide each parameter and then create a completely customized test according to your tastes and needs.

If we choose the "Custom" level we can change another two parameters called "Start Time" and "Minimum Time".



Start Time The tests always begin with a "Start Time" (usually 1 sec.), which will then increase or decrease up to the value set in the "Minimum Time” parameter.

Minimum time The minimum time (default 32 ms) is also called the "WOW! Factor" (always visible during the trial) and is a target that you can give your athlete/patient to strive for.

In all the cognitive tests that we are going to describe, the ***response time*** available is never a parameter to be set, because it is an "*adaptive time*" that is self-regulating based on our previous answers.

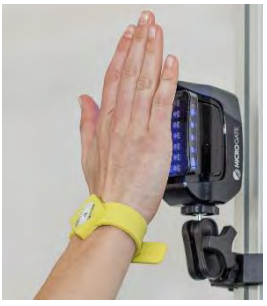
If in fact we are good and we respond quickly, the time available for us will shorten (making the exercise harder), vice versa if we have trouble and are slower, the time will lengthen (making the exercise easier). The purpose in fact is not to "depress" or discourage people who at the beginning have more issues in doing the exercise, but to lead them to progress little by little and see their time shorten.

During the execution of a test the Witty Timer user interface will show:

- In the green box at bottom left the **Repetitions Number**
- At bottom right the **Response Time** (set at the beginning as the **Start Time**)
- The right and left arrows will color respectively green or red depending on whether our answers are improving or worsening compared to the previous ones
- At top right the WOW! Factor equal to the **Minimum Time**

If we have the test repeated at the same bib number (we then increase the trial number and leave the #bib fixed) the response time will restart from when the previous test ended. Similarly, if we have transferred the athletes' names (and consequently the tests are associated with a specific GUID), the response time will be equal to the last one recorded for that particular type of exercise.

Note: When the following explanations say to "switch off" or "press" the semaphore, it always means moving a hand close to it in order to black out a proximity sensor. There is never any need to physically touch the semaphore.

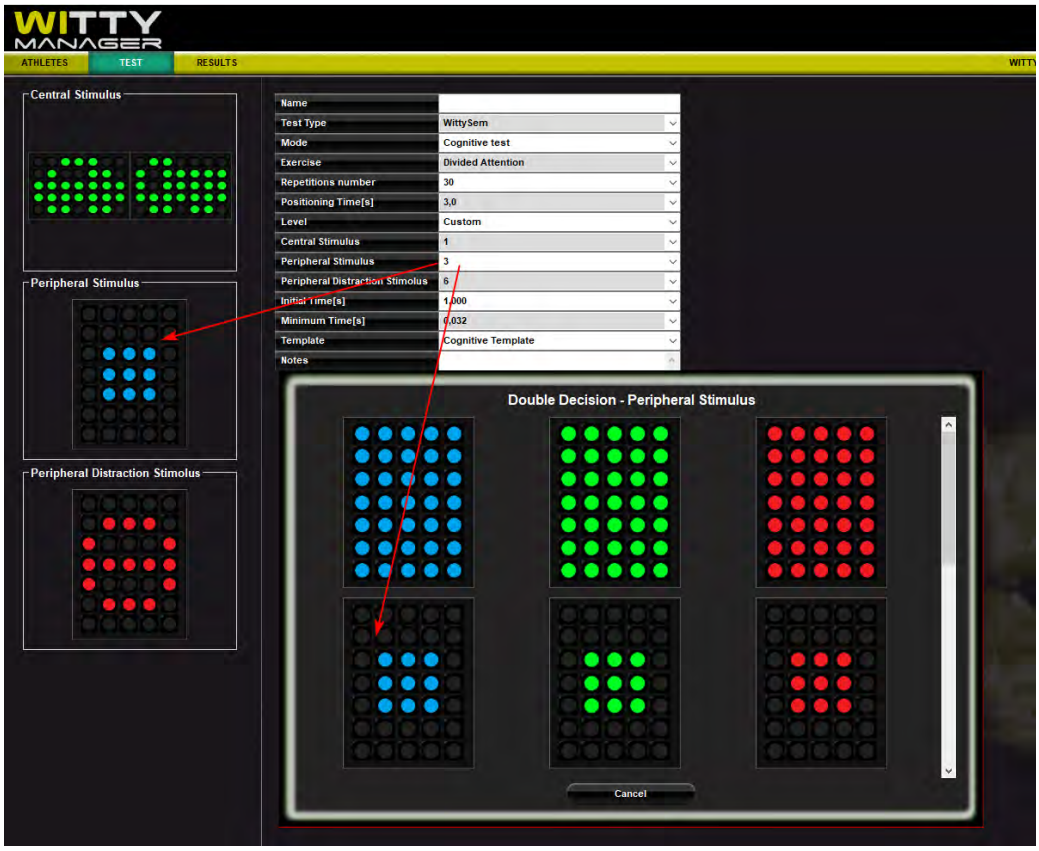


Creating Tests and Custom Levels

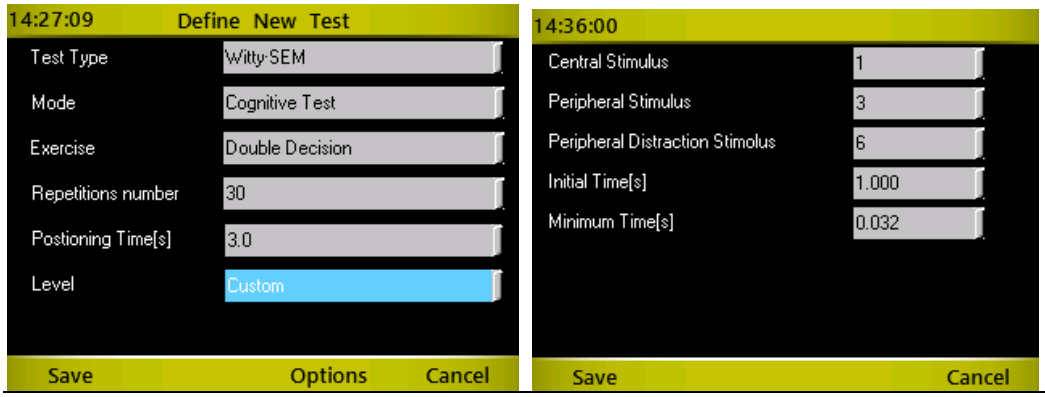
If the 5 levels that we provide for each single test are not sufficient, you can create a Custom Level by selecting the various parameters that make up the exercise. We strongly recommend that you execute this task with the PC software Witty Manager because the custom parameters are assigned with exemplary graphic popups. On Witty Timer this operation is still possible, but due to a lack of space we would be forced to select the parameters only through their numerical value (via a drop-down list) and to keep an eye on the manual for reference to know the corresponding graphic value.

Example: Creating a Custom Level for the Double Decision test

Using WittyManager, every time you click on a drop-down list, a popup is displayed from which you can select the corresponding figure



When creating the test on Witty Timer you need to refer to the manual to know which figure you want to select



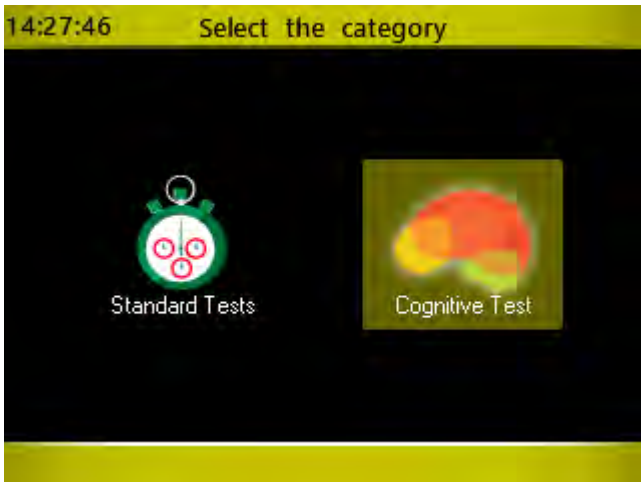
Number of Semaphores and their Positioning

The number of semaphores normally needed to carry out the test varies from a minimum of 4 up to 8.

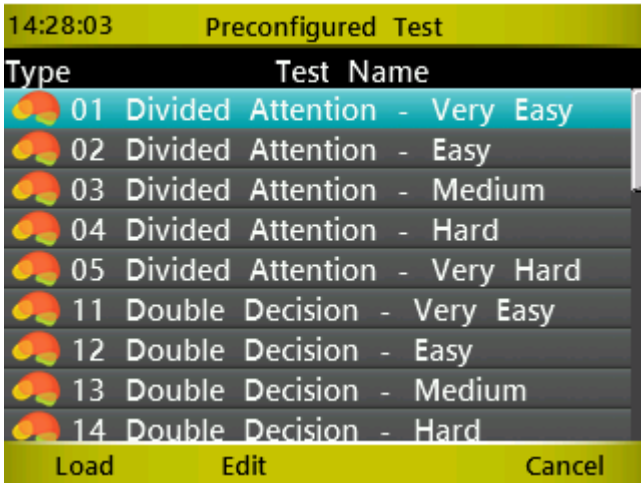
They can be used on supports such as our **Witty Frame**, on ordinary tripods supplied as a standard accessory or attached onto another support such as wall bars.

In the description of the various tests, we will provide a recommended configuration on the minimum number and on how to position them, but it will be for you to adapt the setup to the specificity of the athletic gesture or rehabilitation; for example an ice hockey goalie is hardly going to work with semaphores set high up, but will instead prefer a setup in an "arc" that mimics his usual gesture.

To execute a standard and preconfigured cognitive type of test, from the main menu select Test > Predefined Tests > Cognitive Tests

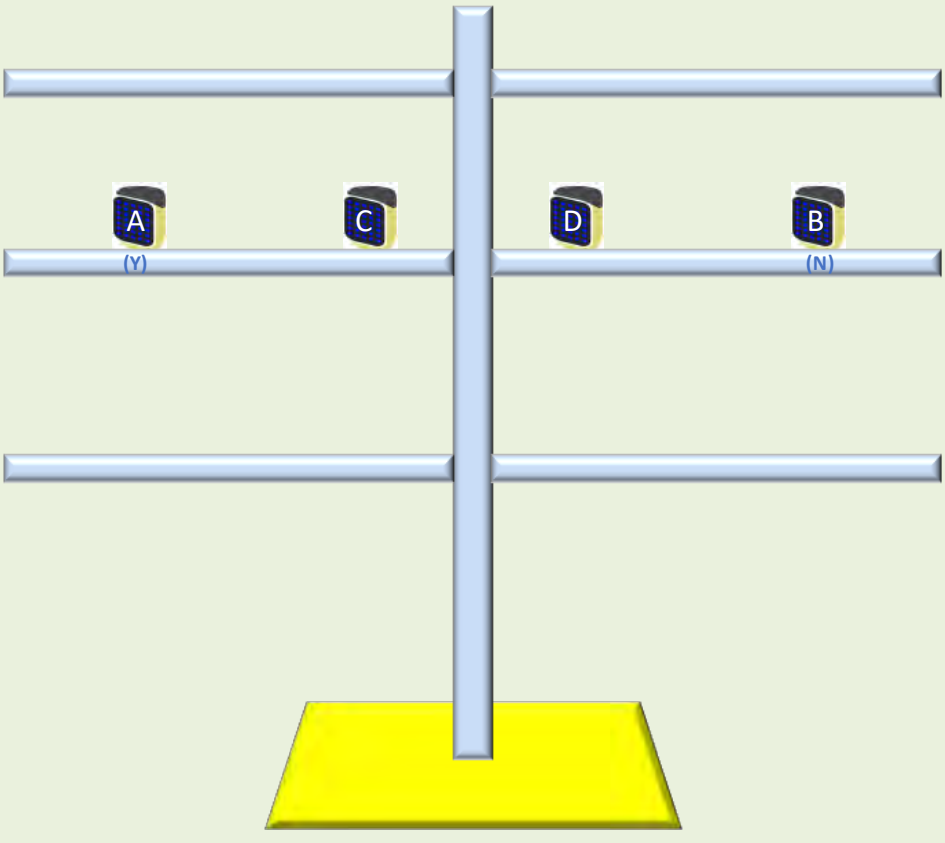


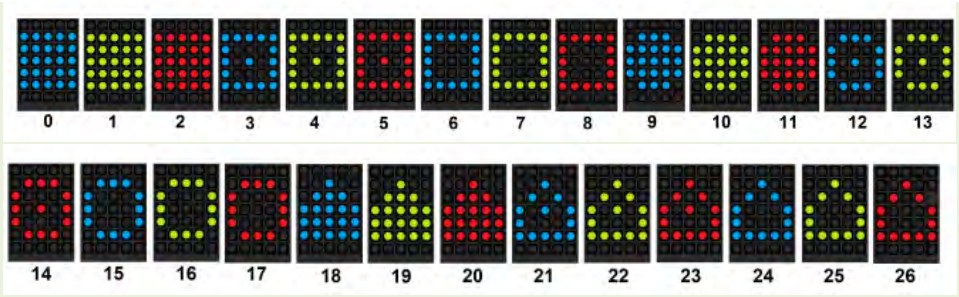
All 30 of Microgate's predefined tests (6 tests x 5 levels) will be listed



Let us now look at the 6 tests one by one with their details

4.4.6.1 Divided Attention

In Short	Watch two shapes when they appear on the semaphores and decide whether they satisfy certain criteria
Description	The "**Divided Attention**" Test challenges your brain to focus and react to particular details – combining colors, shapes and/or patterns – while rejecting competing information. Two shapes are shown on two semaphores, asking to "switch off" semaphore "A" (paired with answer "Y") when certain criteria are met. For example, you could ask to switch off semaphore A when the two shapes are of the same color, or semaphore B when they are not.
BrainHQ Test	**Divided Attention**
Url	https://www.brainhq.com/why-brainhq/about-the-brainhq-exercises/attention/divided-attention/
Explanatory video	https://youtu.be/GxbSicDwnPU
Trained skills	Attention
Number of semaphores	4
Positioning	Place semaphores "C" and "D" to your liking (e.g. in the middle of the frame, or more distant if you want to train peripheral vision, etc.). Place the two semaphores "A" and "B" so that for the user it is simple to use them as YES / NO "buttons". 

Performing the Exercise	The user receives the task assigned on the basis of one of the 5 predefined levels or a previously prepared custom level. E.g. *Answer "Y" if you see two different shapes, answer "N" otherwise.* When two shapes appear on semaphores C and D the user selects one of the two answers; a different sound distinguishes the right answer from the wrong one. If the user does not answer in the allotted time (1 second at the beginning) the answer is considered as if it were wrong and consequently at the next turn the available number of milliseconds is increased. On the contrary, the more right answers are given the more the time shortens, making the exercise harder
Symbols Used	

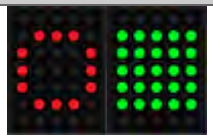
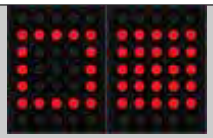
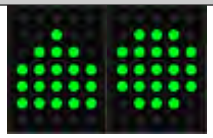
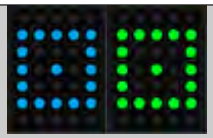
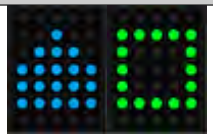
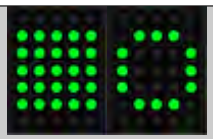
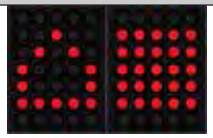
Explanation of the Levels

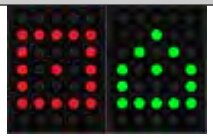
Level	Answer "Y" (=switch off semaphore "A") if the shapes displayed on C and D
1 - Very Easy	have the ***same color***
2 - Easy	have ***a different shape***
3 - Medium	have a ***different interior***
4 - Hard	have ***the same color and a different interior***
5 - Very hard	have ***the same interior and a different shape***

Custom Parameters

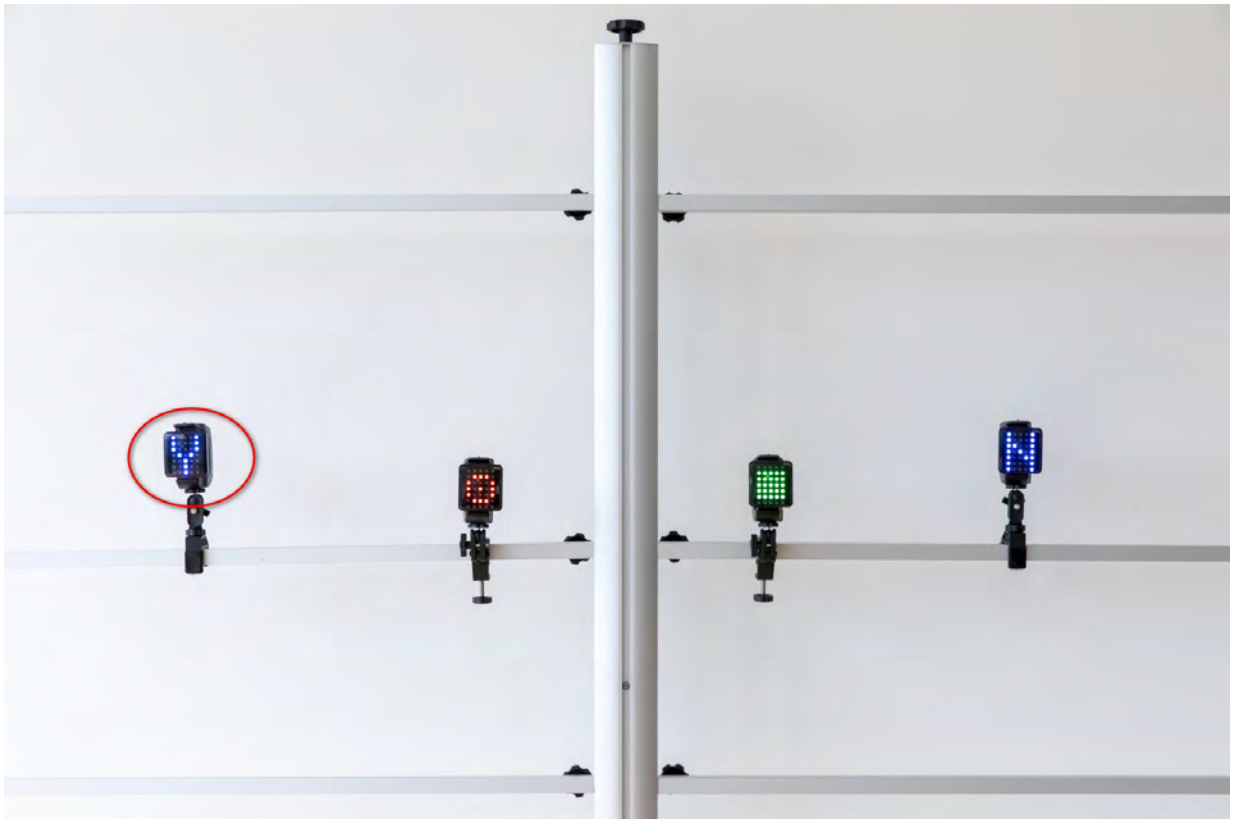
To create your own custom level, the "**Exercise Mode**" parameter is available that can take on these values:

Value	Meaning	Example
0 (=v.easy)	Same Color	
1 (=easy)	Same Shape	

2	Same Interior	
3	Different Color	
4	Different Shape	
5 (=medium)	Different Interior	
6	Same color and same shape	
7	Same color and same interior	
8	Same shape and same interior	
9	Different color and different shape	
10	Different color and different interior	
11	Different shape and different interior	
12	Same color and different shape	
13 (=hard)	Same color and different interior	

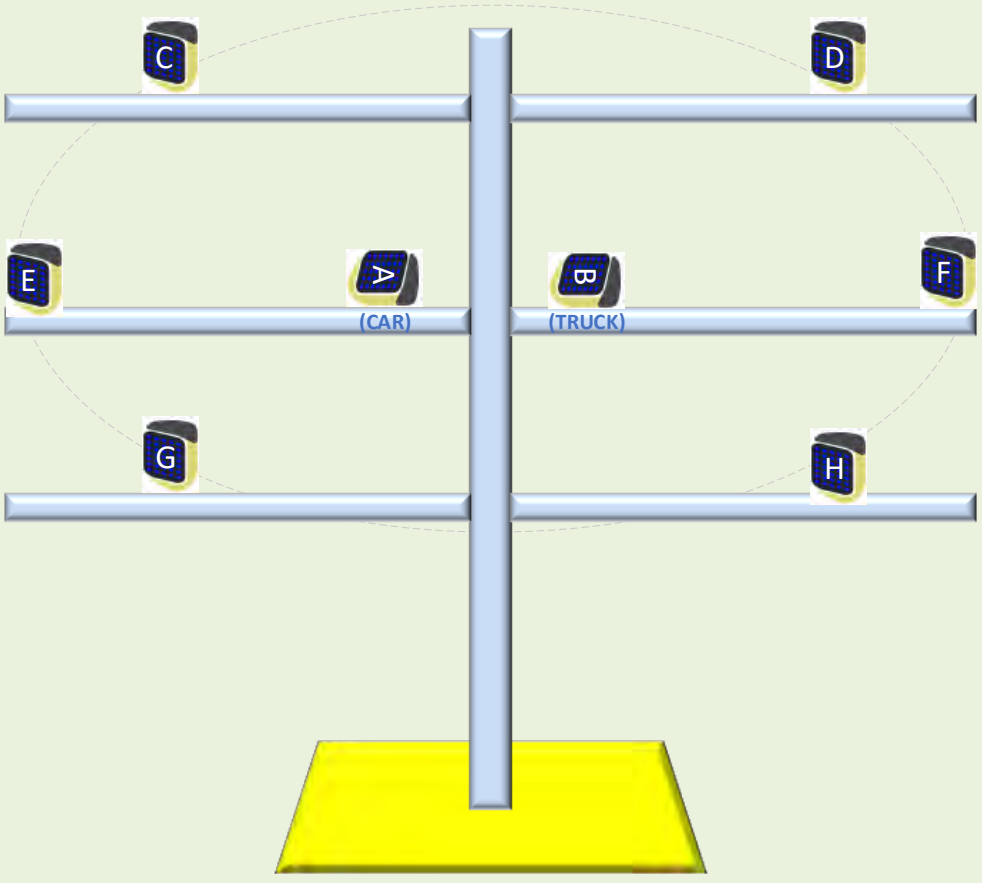
14	Same shape and different interior	
15	Same shape and different color	
16	Same interior and different color	
17 (=v.hard)	Same interior and different shape	

Example: Easy Level (select Y if they have a different shape)



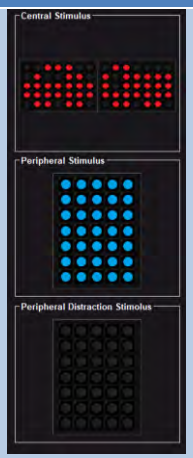
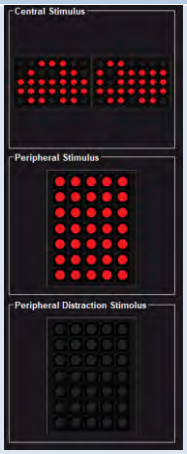
Example: Very Hard Level (same interior and different shape)

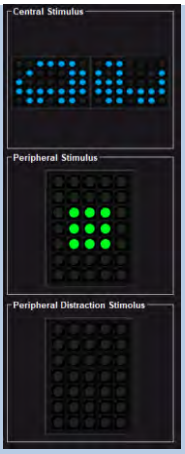
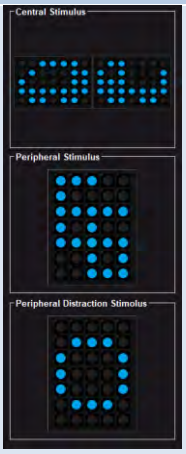
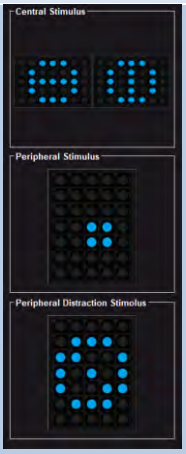
4.4.6.2 Double Decision

In Short	Select which “type of car" you saw on the two semaphores in the middle of the frame and identify the semaphore that displayed the symbol selected as a "peripheral stimulus"
Description	The "**Double Decision**" Test uses proven technology in an unambiguous manner to accelerate processing and expand the useful visual field. Studies show many advantages in training with this technology, including faster visual processing, an expanded useful visual field, safer driving and much more.
BrainHQ Test	**Double Decision**
Url	https://www.brainhq.com/why-brainhq/about-the-brainhq-exercises/attention/double-decision/
Explanatory video	https://youtu.be/sCX2agoOm14
Trained skills	Useful visual field, visual processing speed
Number of semaphores	Minimum 4, recommended 8
Positioning	Place the two semaphores "A" and "B" in the middle of the frame, near each other and rotated through 90°; they will be those where the "car" or "truck” symbols appear. Place the other semaphores in a circle around the central ones, so as to create "sectors" where the peripheral stimulus symbol is to be recognized. 

Performing the Exercise	On the central semaphores A and B the user is shown a symbol–which is the same for both semaphores–corresponding to two icons (which we will call "car" and "truck" since in the original test they have this shape). In addition, a symbol appears on one of the other peripheral semaphores. When the two fixed icons (different this time) appear in the middle, the user must indicate which one appeared and then on which semaphore the peripheral symbol appeared. To complicate the exercise, the peripheral semaphores can light up with a "distraction symbol" which makes it harder to perceive the semaphore with the peripheral stimulus. At the easier levels there is no distraction stimulus (semaphores switched off)

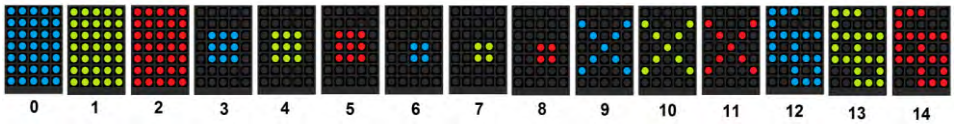
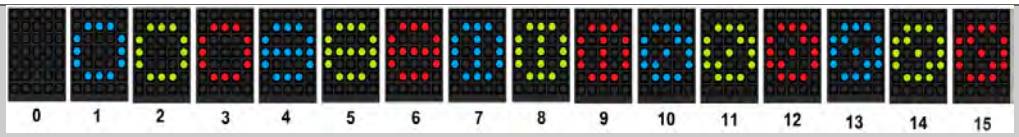
Explanation of the Levels

Level	Description	Example
1 - Very Easy	Icon of the "central stimulus" red and "solid" peripheral stimulus blue; no distraction stimulus	
2 - Easy	Icon of the "central stimulus" red and "solid" peripheral stimulus red; no distraction stimulus	

3 - Medium	Icons of the "central stimulus" blue and similar to each other; peripheral stimulus smaller and green; no distraction stimulus	
4 - Hard	Icons of the "central stimulus" blue and similar to each other; peripheral stimulus blue; stimulus blue	
5 - Very hard	Icons of the "central stimulus" even more similar to each other; peripheral stimulus smaller; distraction stimulus blue	

Custom Parameters

To create your own custom level, the following parameters are available

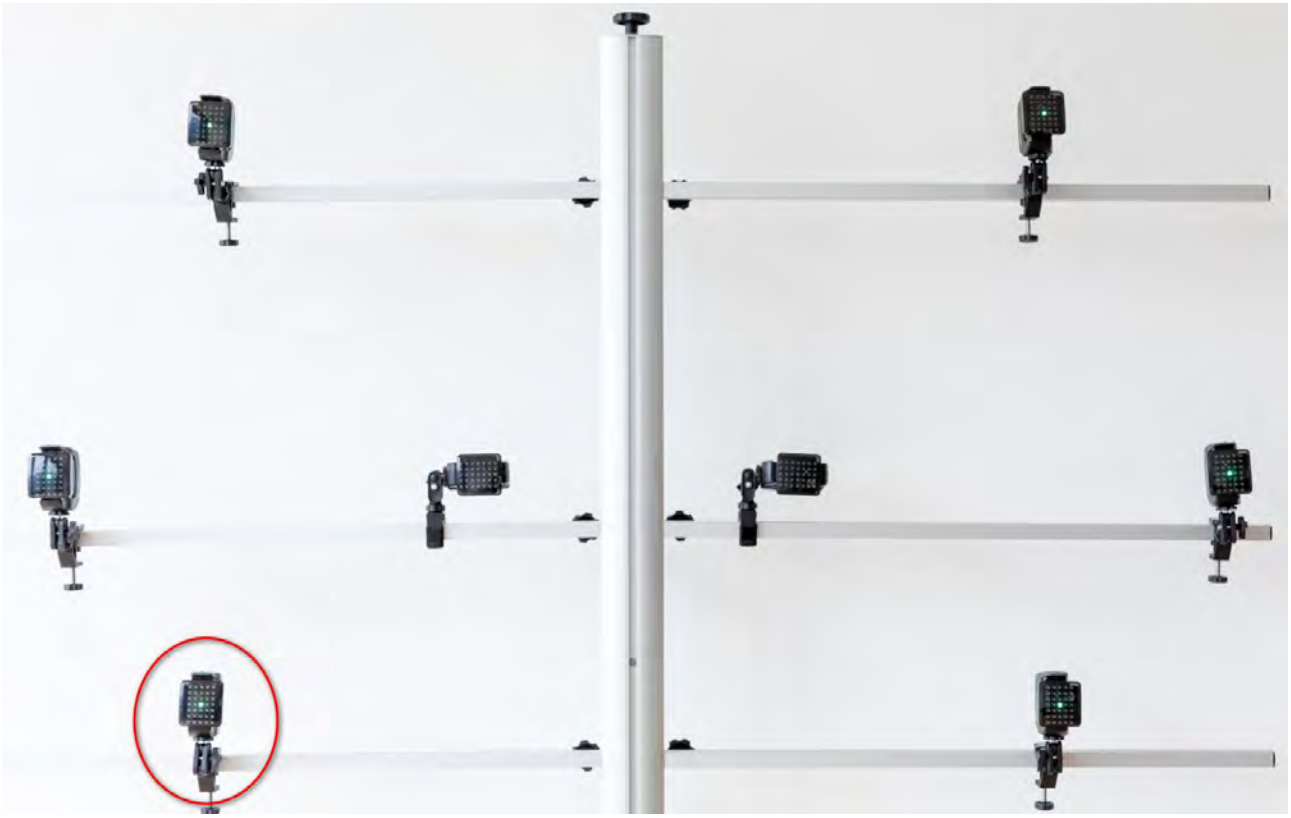
Parameter	Value
Central Stimulus	
Peripheral Stimulus	
Peripheral Distraction Stimulus	

Initial Setup

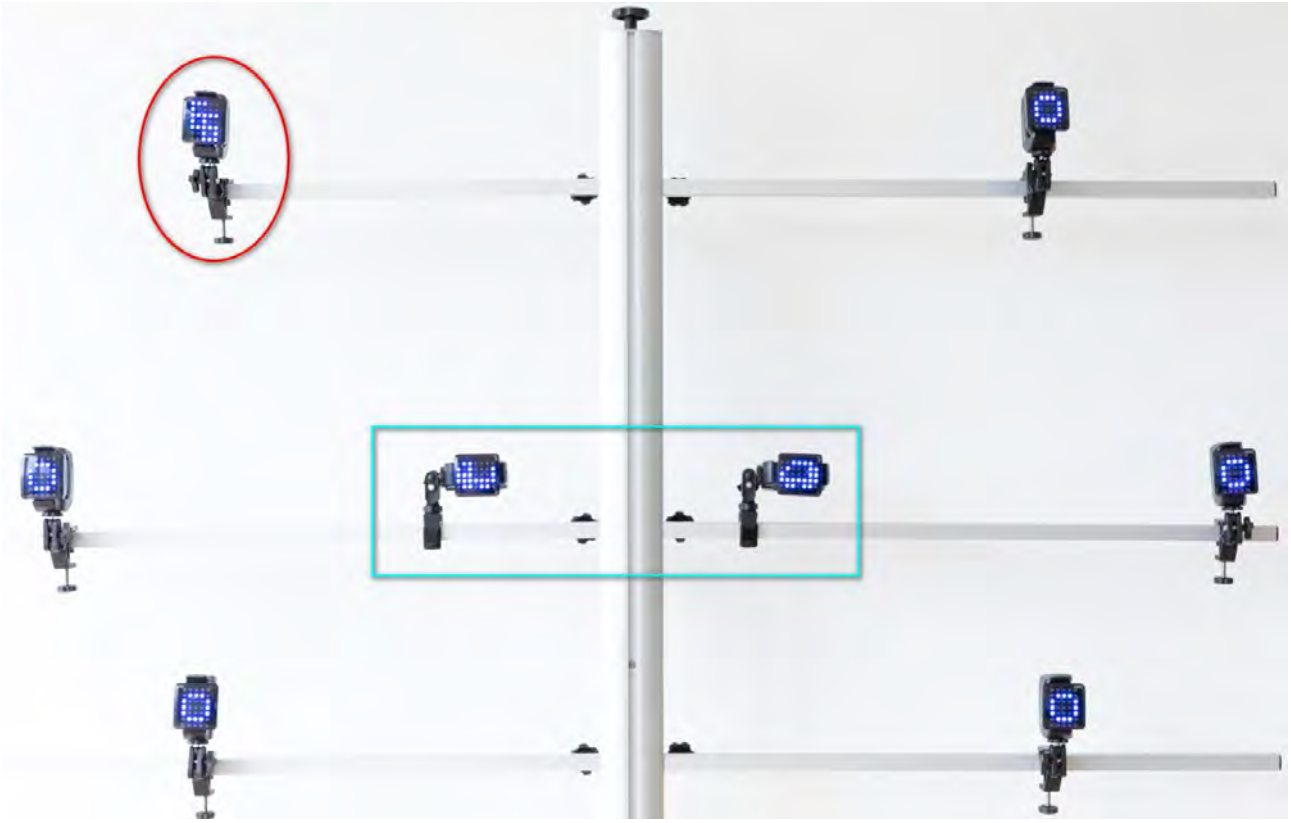
Start… tap a central semaphore to start

This situation appears for a few tenths of a second: the symbol to remember is the truck (the same on both semaphores A and B); the peripheral stimulus is at bottom left

If all the semaphores are off and the central ones offer two options (car or truck?) we should indicate the one that appeared (the truck in the previous example)

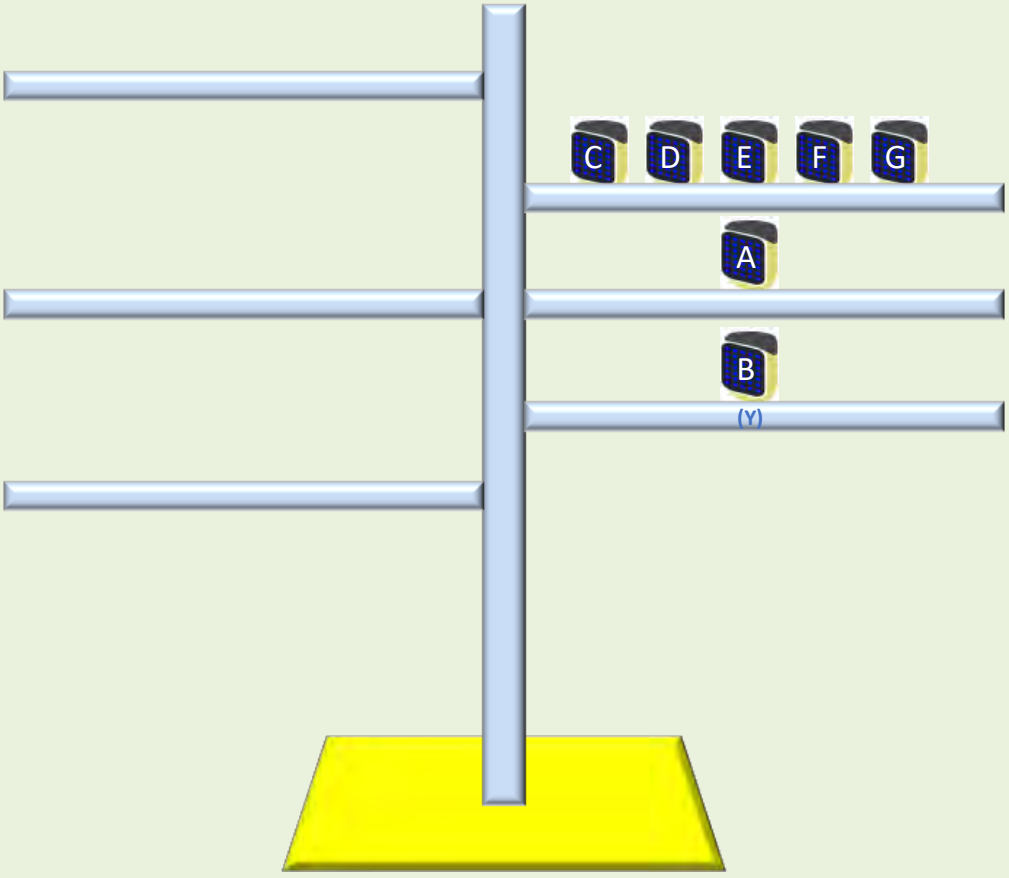


If we answered correctly, we are asked which of the peripheral semaphores came on and then we will indicate the one at bottom left



Example of the very hard level, central stimuli similar to each other, presence of peripheral distraction stimuli and colors all the same

4.4.6.3 Mixed Signals

In Short	Decide if what you see on the 5 upper semaphores matches what is shown on semaphore A
Description	The "**Mixed Signals**" Test is the one that differs most from the original BrainHQ test since the latter uses sound messages that are impossible to have on our semaphores. We have anyhow tried to reproduce the philosophy of the exercise that is the typical one of so-called "Stroop Tests" (e.g. answer YES if the word is written in a certain color or is made up of n symbols, etc.)
BrainHQ Test	**Mixed Signals**
Url	https://www.brainhq.com/why-brainhq/about-the-brainhq-exercises/attention/mixed-signals/
Explanatory video	https://youtu.be/7flHVNxFiBM
Trained skills	Attention
Number of semaphores	7
Positioning	Place the 5 semaphores C,D,E,F,G close to one another as if to form a word. Semaphore "A" is the one on which the user receives the information to be evaluated, while semaphore "B" is the "button" to switch off if the information is correct. 

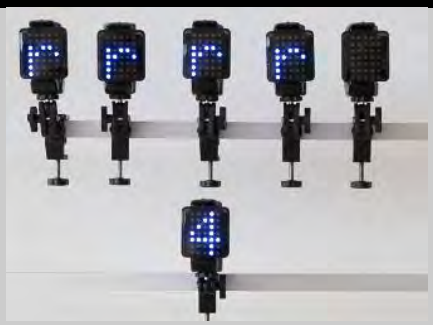
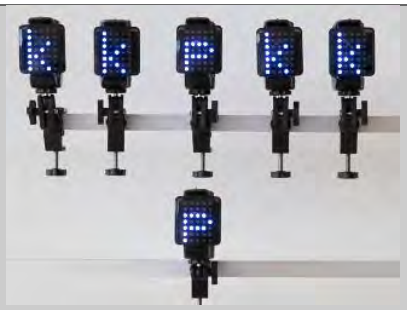
Performing the Exercise	On the top row of semaphores the user is shown a certain type of information (e.g. a number X of letters). On the semaphore below "A" the second part of the information is displayed (e.g. a number) Depending on the task assigned (e.g. "*the number you see is the same as the number of letters you see above*") the user must answer "Y" if the information matches, and must do nothing if it does not.

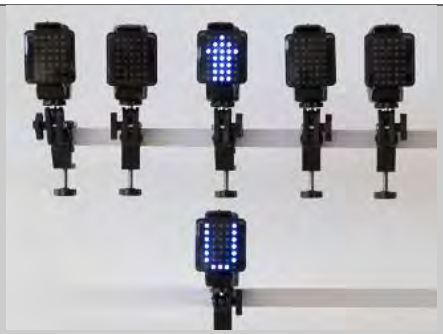
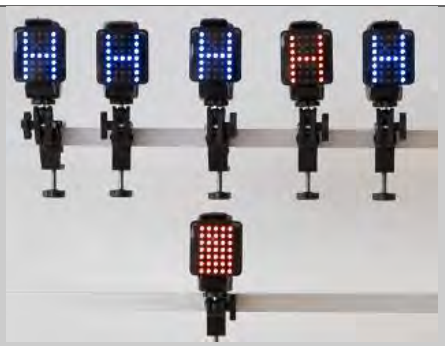
Explanation of the Levels

Level	Description
1 - Very Easy	Number equal to the number of objects (L1)
2 - Easy	Letter identical to the letter in the middle (L1)
3 - Medium	Same direction as the direction of the arrow (L1)
4 - Hard	Color like the color of the character (L1)
5 - Very hard	Color like the color of the character (L3)

Custom Parameters

To create your own custom level, the "**Exercise Mode**" parameter is available that can take on these values:

Value	Meaning	Example (answer = "Y")
0 (v.easy)	Number equal to the number of objects (L1: the elements above are letters)	
1	Number equal to the number of objects (the elements above are numbers)	
2 (easy)	Letter identical to the letter in the middle (L1: the target letter on semaphore A can only be the letter in the middle or a different one to the other 4: e.g. "p" or any but not "k")	
3	Letter identical to the letter in the middle (L2: the target letter on semaphore A can only be the letter in the middle or one of the other 4, e.g. "s" or "t")	

4 (medium)	Same direction as the direction of the arrow (L1: arrow symbol + initial direction)	
5	Same direction as the direction of the arrow (L2: direction word + arrow symbol)	
6	Color like the color of the character (L1: a set of letters with one of a different color to be matched with semaphore A)	
7 (hard)	Color like the color of the character (L2: the word describing the color has a letter of the color to be matched)	
8 (v.hard)	Color like the color of the character (L3: the word describing the color has all the letters the same)	

Examples:

Very Easy Level, answer Y if the number on semaphore A is equal to the number of letters on the semaphores above

Here you need to press "Y" (1=1)

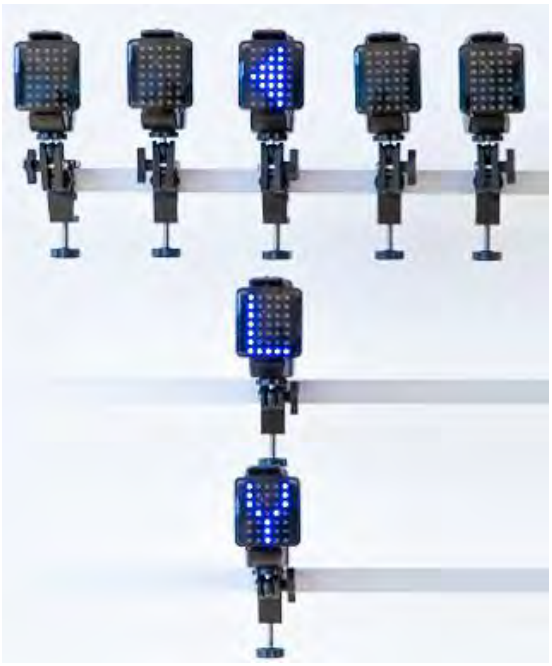
Here I don't have to do anything (5 <> 4)

Easy Level, answer Y if the number on semaphore A is equal to the number of letters on the semaphores above

Here you need to press "Y" (j=j)

Here I don't have to do anything (h <> t)

Medium Level, reply Y if the letter indicates the direction of the arrow (D=Down, U=Up, L=Left, R=Right)



Here you need to press "Y" (Left= left arrow)

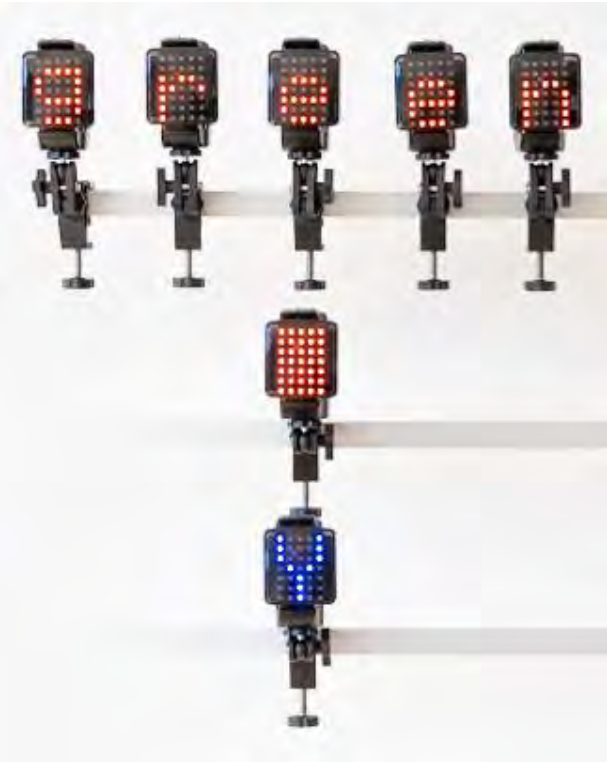
Here I don't have to do anything (Right <> up arrow)

Hard Level, answer Y if the color of the only different letter matches the color of semaphore A

Here you need to press "Y" (red=red)

Here I don't have to do anything (green <> red)

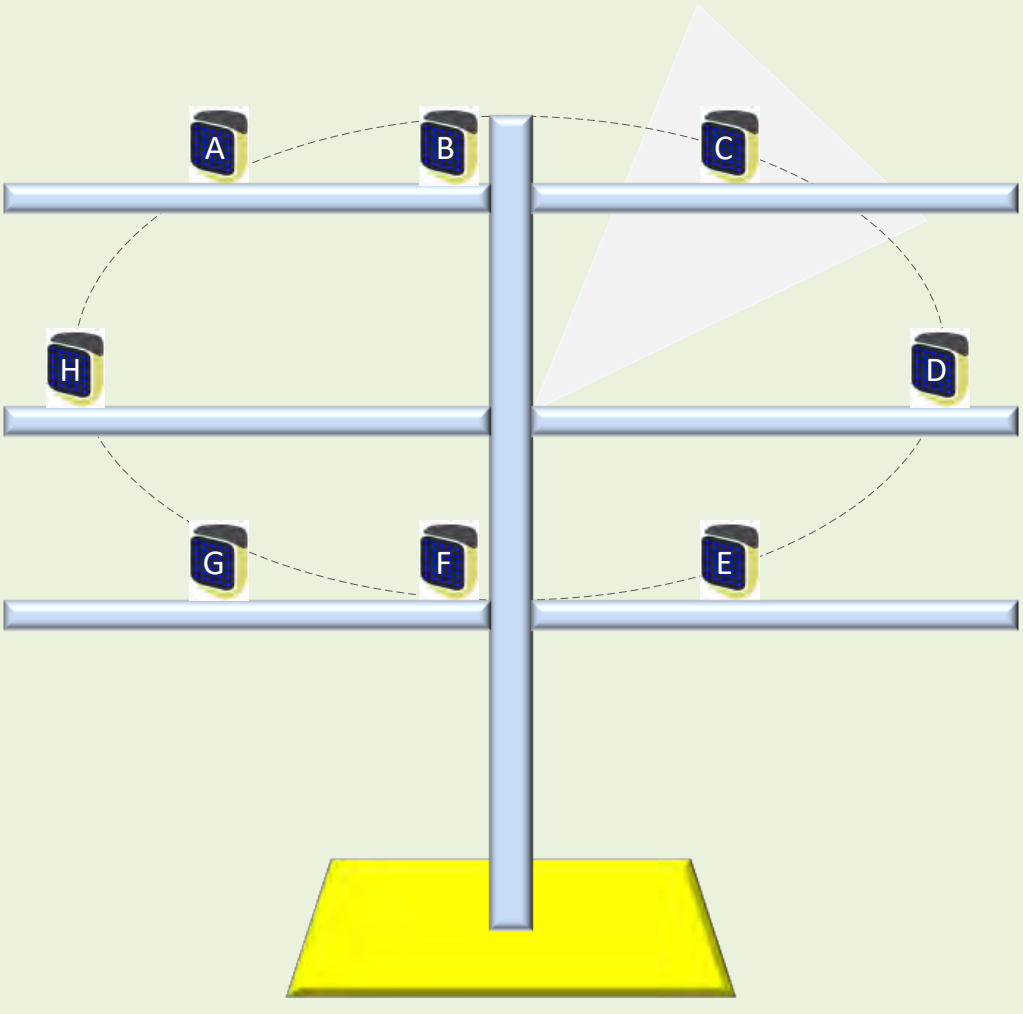
Very Hard Level, answer Y if the color of the text (not its meaning) matches the color of semaphore A



Here you need to press "Y" (red=red)

Here I don't have to do anything (green <> blue)

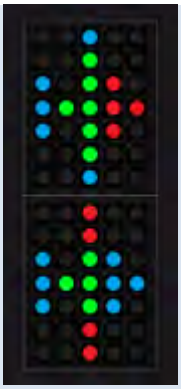
4.4.6.4 Hawk Eye

In Short	Identify the symbol that is different from the others
Description	The "**Hawk Eye**" Test (also called "Peripheral Vision" Test) challenges your visual precision by asking you to locate specific symbols (birds) in your peripheral vision, even when they appear on the semaphores for a very short time.
BrainHQ Test	**Hawk Eye**
Url	https://www.brainhq.com/why-brainhq/about-the-brainhq-exercises/brainspeed/hawk-eye/
Explanatory video	https://youtu.be/QaHkqb-HOdA
Trained skills	Speed and precision of vision
Number of semaphores	Greater than or equal to 4
Positioning	Position the semaphores to form a circle (even 6 semaphores may suffice); it is not necessary for them to be in alphabetical order. Each semaphore must be inside a sector of approximately 45° 

Performing the Exercise	The semaphores display N "birds" that are all the same except for one. When they disappear and the semaphores show a green dot, we need to indicate the position where the different bird was. As the level of difficulty increases, the differences are greatly reduced.

Explanation of the Levels

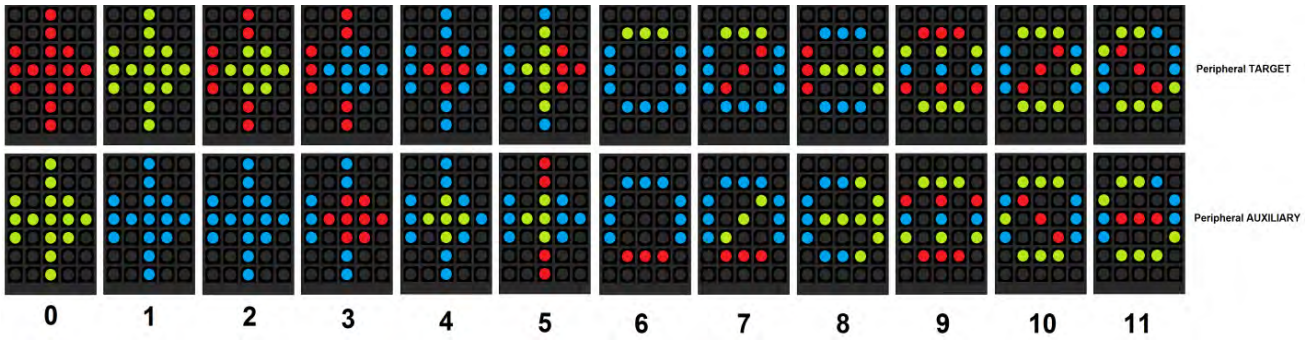
Level	Description	Example
1 - Very Easy	The "different" symbol whose position is to be remembered is red in the middle and the others green	
2 - Easy	The "different" symbol whose position is to be remembered is green/red in the middle and the others blue	
3 - Medium	The "different" symbol whose position is to be remembered is blue/red in the middle and the others blue/green	

4 - Hard	The "different" symbol whose position is to be remembered has the same colors as the others but at different points	
5 - Very hard	The "different" symbol whose position is to be remembered is very similar to the others	

Custom Parameters

To create your own custom level, there is the "**Peripheral Stimulus**" parameter which can take values from 0 to 11; the "different" symbol whose position is to be remembered is at the top, the auxiliary ones at the bottom.

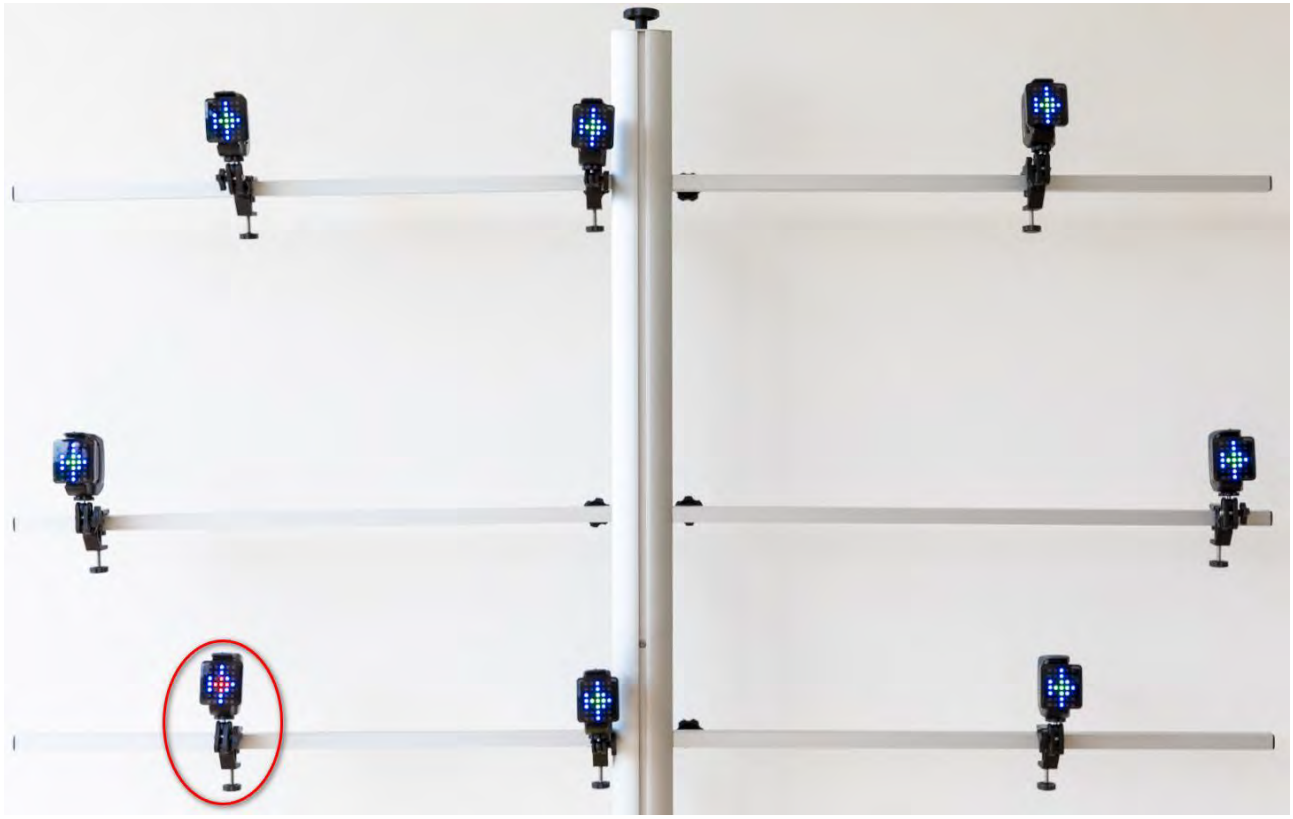
Values 0,2,4,5,9 correspond to the preset Levels described above.



Example:

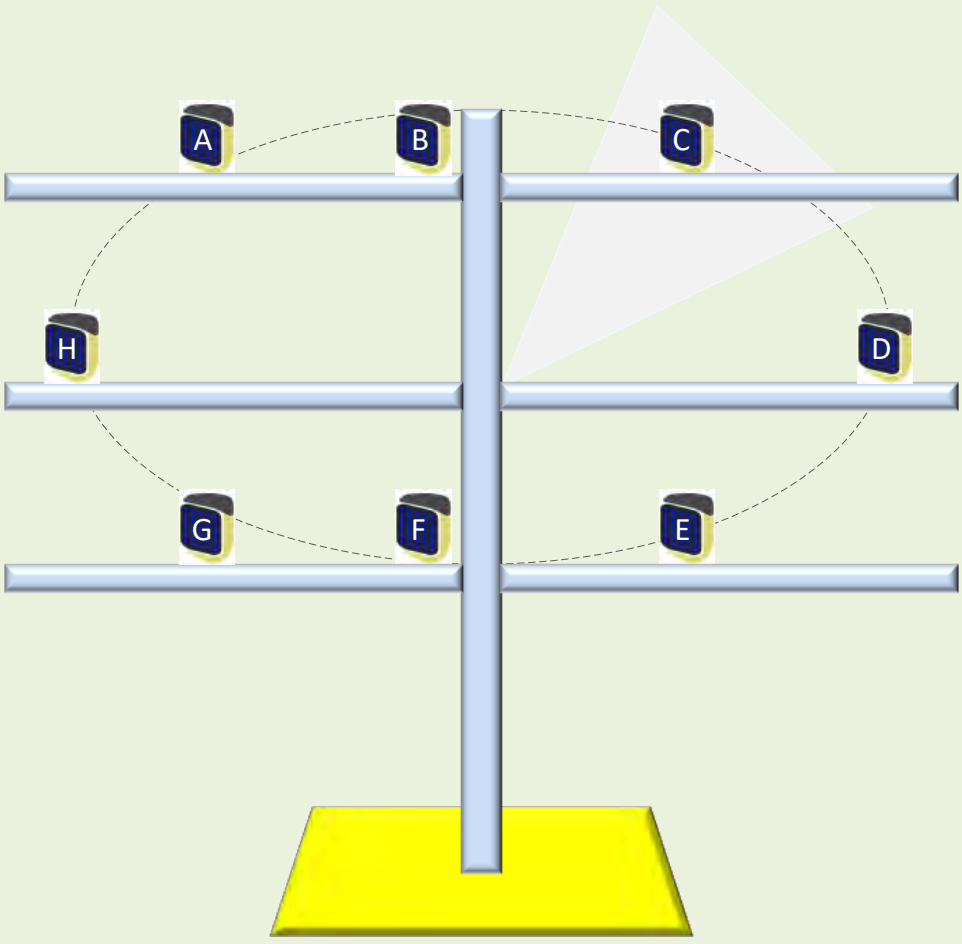
N "Birds" and a different one (its color, shape, etc. can change depending on the level) are shown for a short time

As soon as they switch off we should indicate the position where there was the "different" one



As the level increases, the differences are smaller

4.4.6.5 Eye for Detail

In Short	Find two or more identical images among other similar ones.
Description	In the "**Eye for Detail**" Test a set of 3, 4 or 5 images briefly appear one at a time on different semaphores. Some of the images match exactly, while others are similar but not identical. Your task is to identify where the same images appeared.
BrainHQ Test	**Eye for Detail**
Url	https://www.brainhq.com/why-brainhq/about-the-brainhq-exercises/brainspeed/eye-detail/
Explanatory video	https://youtu.be/tMczf0ZwZGU
Trained skills	Visual processing speed, visual memory
Number of semaphores	Greater than or equal to 4
Positioning	Position the semaphores to form a circle (even 4 semaphores may suffice); it is not necessary for them to be in alphabetical order. Each semaphore must be inside a sector of approximately 45° 
Performing the Exercise	Depending on the level a certain number of symbols ("butterflies") appear one at a time. A number of these are identical (for example at the first two levels 3 butterflies

	appear and 2 of these are identical). When they disappear and the semaphores show a green dot, we need to indicate the position where the identical symbols were.

Explanation of the Levels

Level	Symbol	Total No. of Symbols	No. of Target Symbols
1 - Very Easy	Butterfly	3	2
2 - Easy	Circle	3	2
3 - Medium	Butterfly	4	2
4 - Hard	Butterfly	5	3
5 - Very hard	Circle	5	3

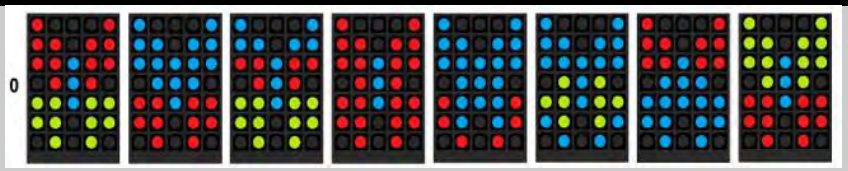
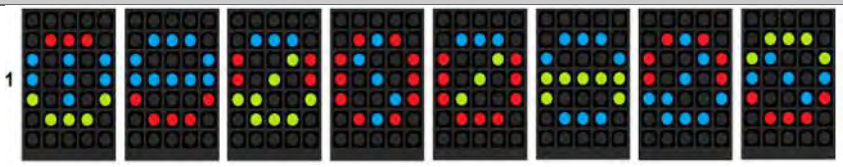
Custom Parameters

To create your own custom level, the following parameters are available:

Total Stimulus Count: The total number of symbols that will appear one at a time

Target Stimulus Count The number of identical symbols

Peripheral Stimulus Set

Value	Meaning	Example
0	Butterfly Symbol	
1	Circle Symbol	

Example: Easy Level, 3 butterflies are shown in sequence, 2 of which are identical:

Butterfly 1

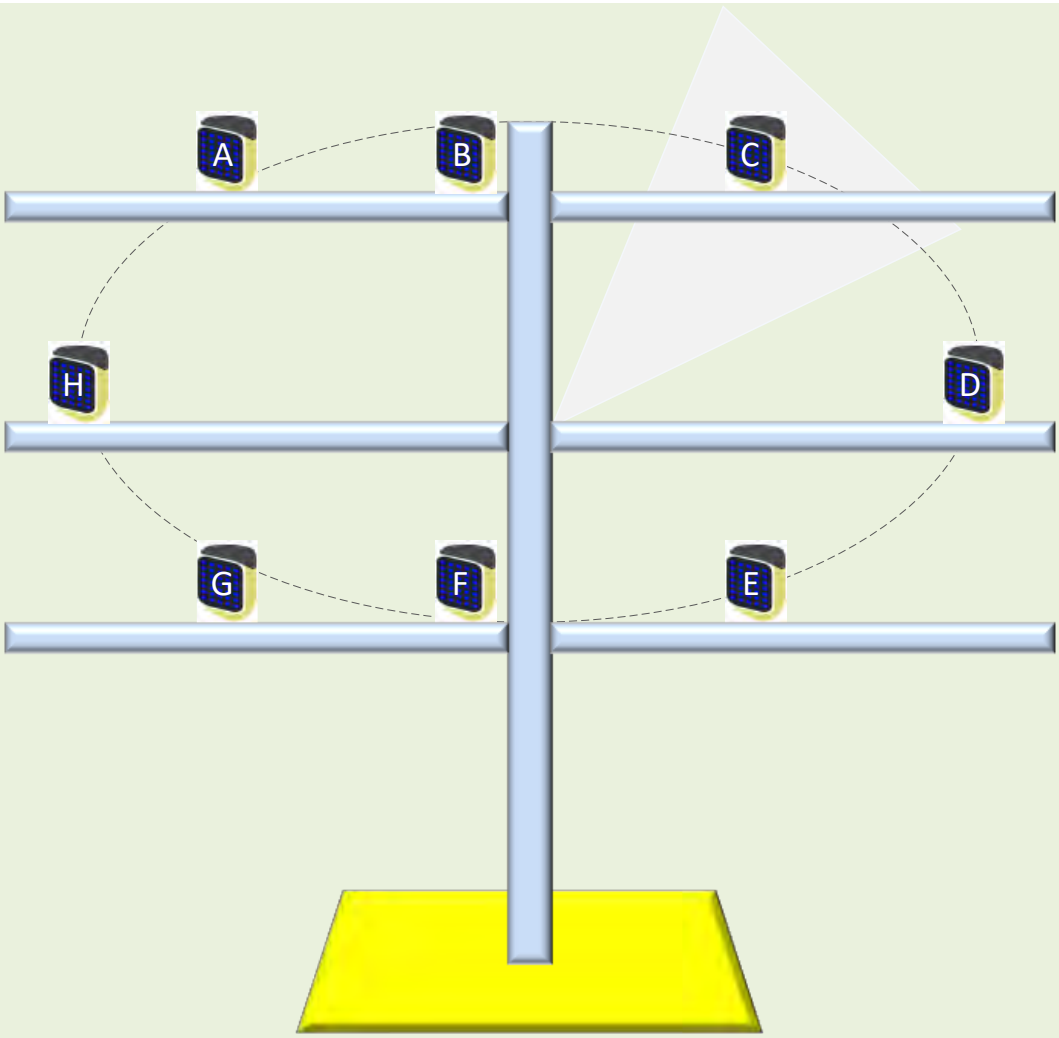
Butterfly 2

Butterfly 3

When they switch off we should indicate where the two identical ones were

4.4.6.6 Juggle

In Short	Reconstruct a sequence of numbers in the correct positions
Description	The "**Juggle**" Test challenges you to retain several pieces of information in your working memory while you handle them. This exercise will improve your ability to make swift decisions and solve problems in complex environments.
BrainHQ Test	**Juggle Factor**
Url	https://www.brainhq.com/why-brainhq/about-the-brainhq-exercises/intelligence/juggle-factor/
Explanatory video	https://youtu.be/Tx17beouWjg
Trained skills	Memory, Intelligence
Number of semaphores	Greater than or equal to 6
Positioning	Position the semaphores to form a circle (even 6 semaphores may suffice); it is not necessary for them to be in alphabetical order. Each semaphore must be inside a sector of approximately 45°



Performing the Exercise	A numerical sequence (e.g. 1,2,3,4,5 or 5,4,3,2,1 or in random order) is shown by switching on the semaphore numbers one at a time. At the end of the sequence when the semaphores show a green dot, we need to indicate the positions of the numbers in an ascending sequence (therefore always 1,2,3,4,5). You can add a distraction element (semaphore that illuminates red).

Explanation of the Levels

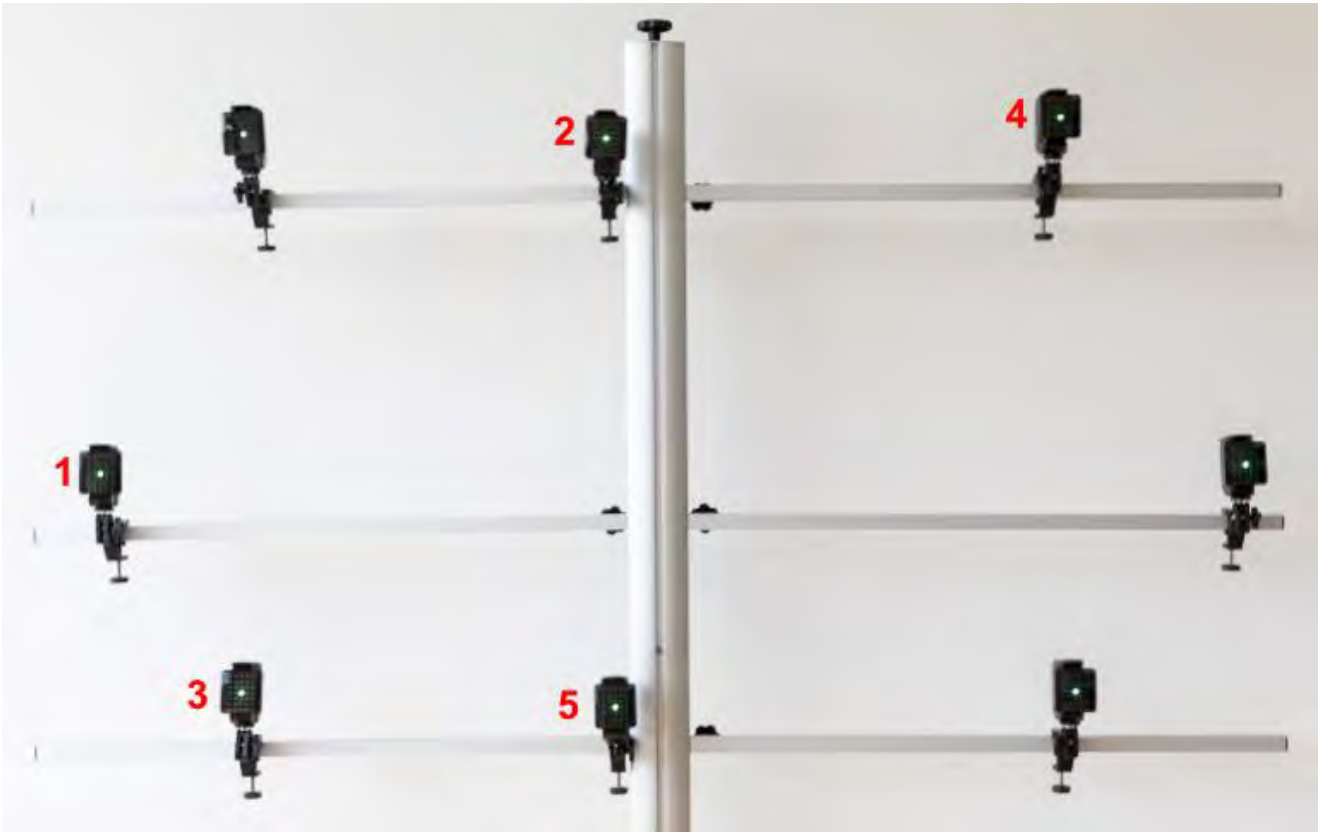
Level	Sequence	Distraction Element
1 - Very Easy	Incremental	NO
2 - Easy	Incremental	YES
3 - Medium	Decreasing	NO
4 - Hard	Decreasing	YES
5 - Very hard	Random	YES

Custom Parameters

To create your own custom level, the "**Exercise Mode**" parameter is available that can take on these values:

Value	Meaning
0 (v.easy)	Ascending sequence (1..5)
1 (easy)	Ascending sequence (1…5) plus distraction character
2 (medium)	Descending sequence (5…1)
3 (hard)	Descending sequence (5…1) plus distraction character
4	Random sequence
5 (v.hard)	Random sequence plus distraction character

Example: Easy Level (ascending sequence plus distraction character)



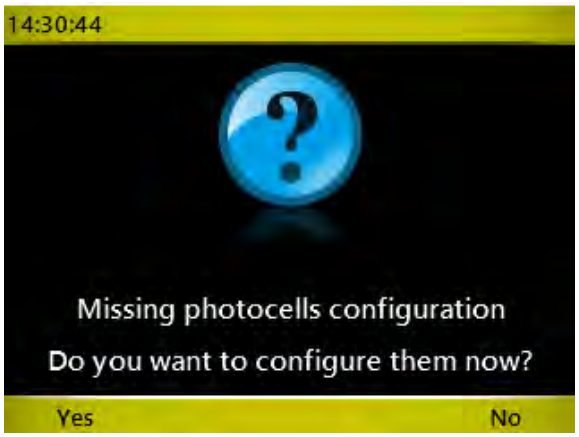
The sequence to be reconstructed by tapping the semaphores in this order

4.5 DUAL TEST

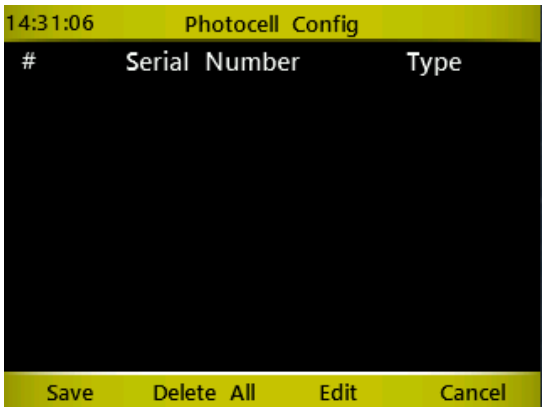
The "Dual Test" type is useful when we have to time a "parallel" type of trial in which two athletes take part at the same time. It is essentially identical to the Sprint test ("In Line" and "Go & Return") so please see chapters 4.1.1 and 4.1.2 for the common explanations.

What differs is the initial configuration that is needed to indicate which photocell(s) form part of Track 1 and which of Track 2.

As explained in chapter 4.2.1 it is possible, and advisable, to make the configuration in the test definition phase or at the first execution, when if there is no setup you are in fact asked:

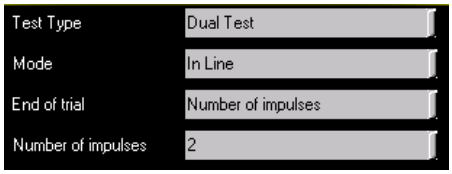


On answering <F1> (Yes), this window appears.



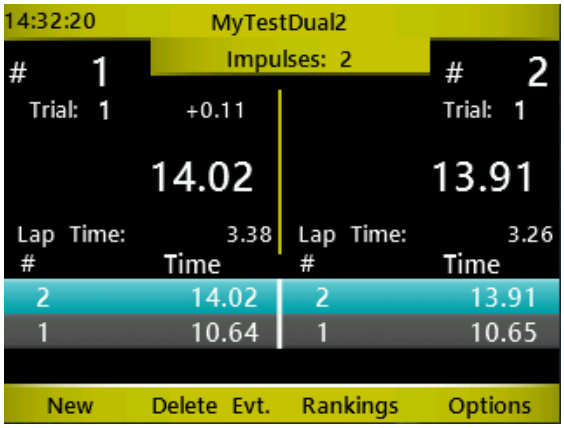
Let's now "cut" the N photocells (4 in a classic Start and Stop configuration with two lanes) and say for each one to which track they belong.

It is not necessary to specify which type of impulse it is (Start, Stop, Lap) since during the trial it is inferred from the "Number of impulses" parameter that we entered in the definition phase (always remembering that the start is not to be counted, so if we have Start, a Lap and Stop we will enter "2").



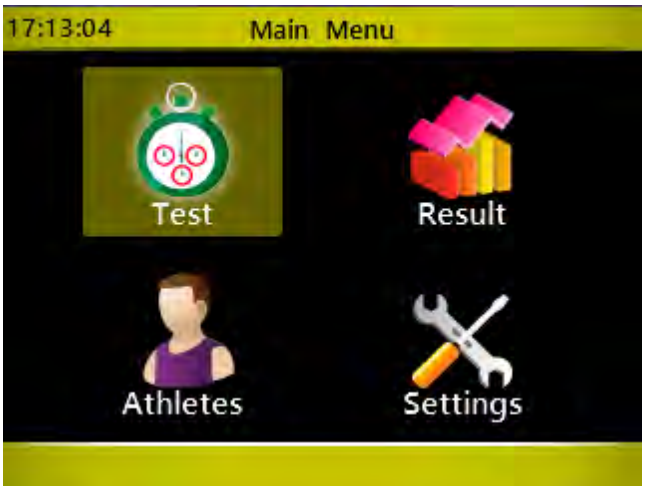
The interface on the timer has the screen split into two sides, Track 1 on the left and Track 2 on the right. At the end of a trial the gap is always shown on the side of the "losing" competitor.

All operations (entering bibs, rankings, deleting events, etc.) are similar to the above-mentioned Sprint tests.



5 FUNCTIONS OF THE WITTY TIMER

The main menu displays the four macro areas, which will be described in the following chapters.



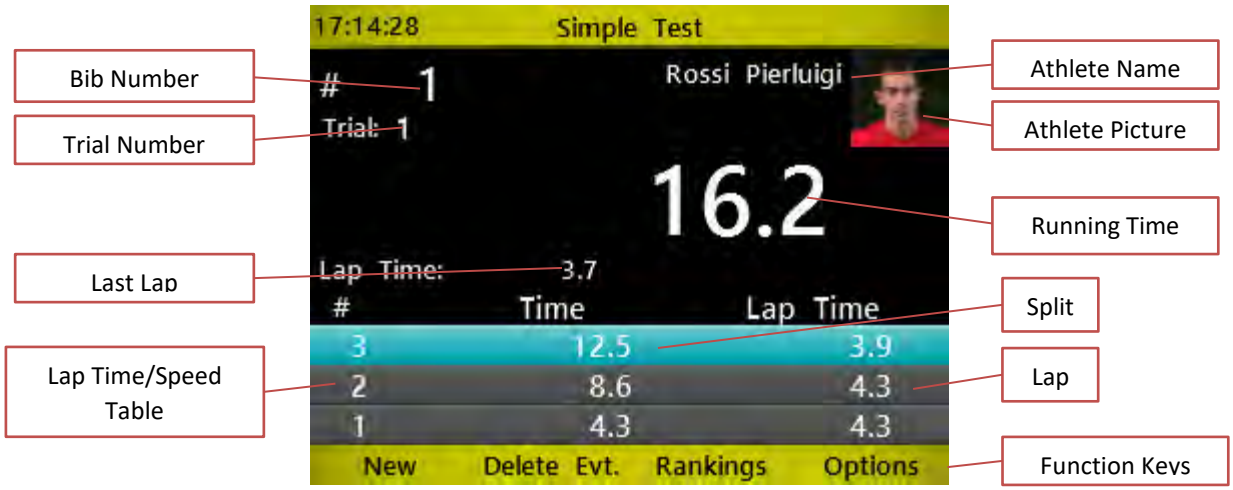
5.1 TEST

The Test section, the heart of the Witty software, allows to perform timing actions and define particular customized test types (this can also be carried out from the *Witty Manager* PC software).

5.1.1 Simple Test

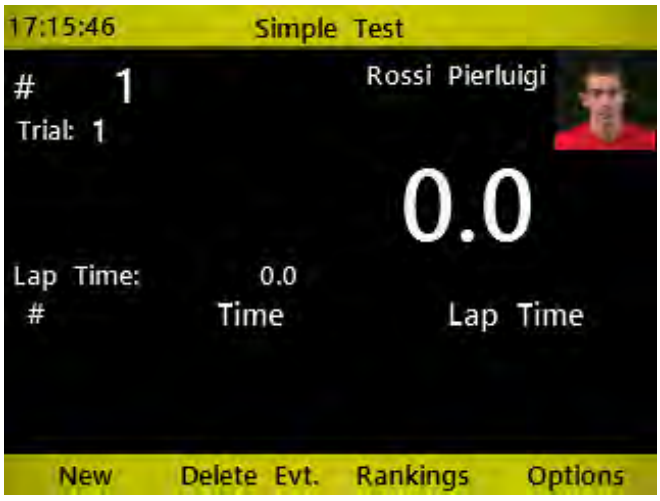
The Simple Test is simply a 'Basic / In Line' test (see chap. 4.1.1) with a defined number of lap times (from 0 to n).

The elements displayed on the screen when timing are as follows:



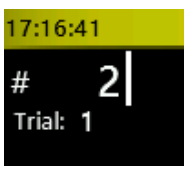
In order to familiarize with the Witty timer functions, substitute the impulses received from the photocells by pressing the Start and Stop keys on the left side of the timer (lap times are simulated by pressing the <*STA*> key).

Press the Simple Test icon in the Test menu and access the timing function. If no start list and athlete names/pictures have been set with the WittyManager software, the displayed screen will appear as follows:



Now the athlete with bib number 1 can begin Trial number 1.

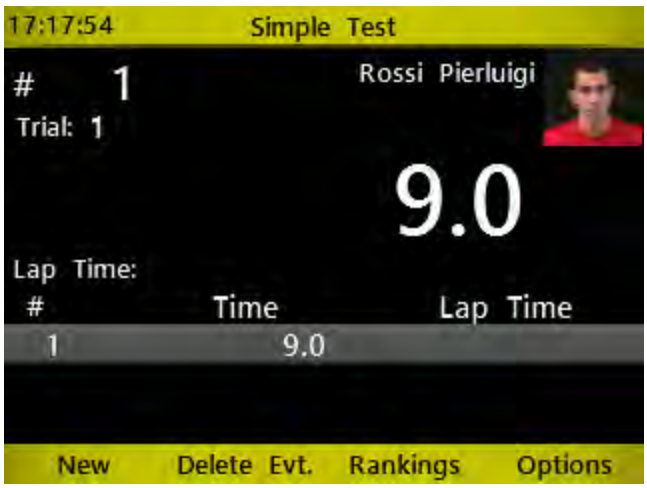
If another athlete is in starting position, enter his bib number using the numerical keypad and press <*OK*>.

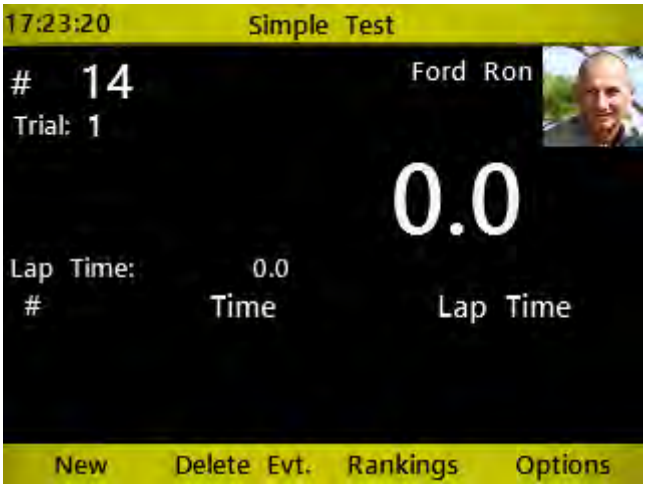


Now have the athlete cross the Start photocell (or press the <*STA*> key) and timing will begin. When the photocell is interrupted for the second time, timing is stopped and the first line containing time and lap time

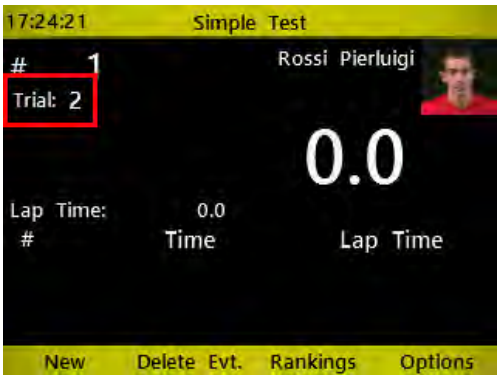
(which of course are the same) appear in the table. After 3 seconds timing is resumed (as in this test type an undefined number of laps is possible and the photocells always give a Start/Lap impulse and never a Stop impulse).

Press <*F1*> New and the system asks, if you want to continue with another athlete. If so, the following athlete is suggested (bib no.+1 or, if a start list has been provided, the next one on the list).

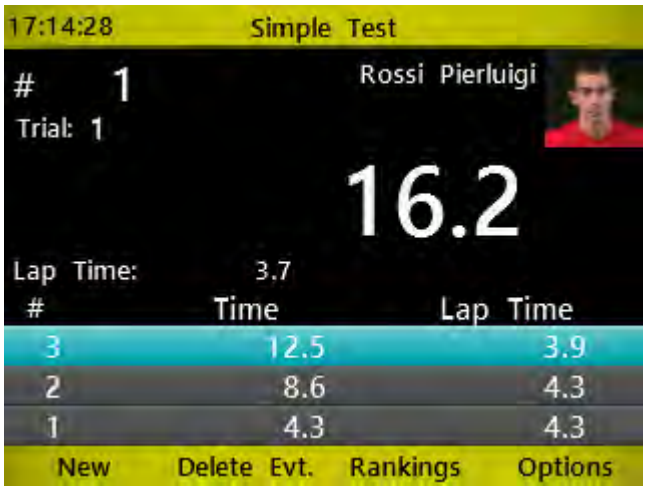




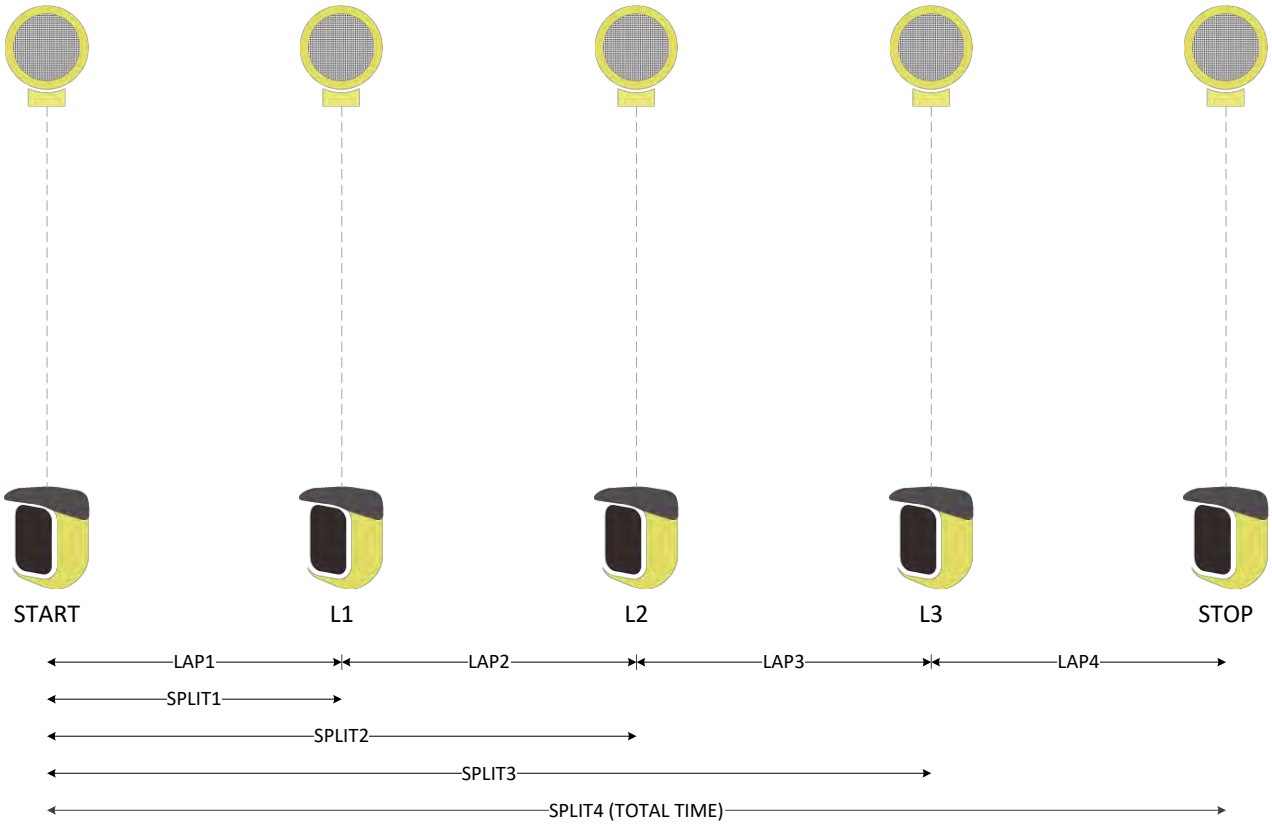
If you enter the bib number of an athlete who has already carried out a trial, he will be accepted but the Trial number will be increased by one.



If there is more than one photocell for lap timing, the lap times are saved and displayed as a table which can be scrolled using the <*up*> and <*down*> arrows. The scrollbar on the right indicates that there are more lap times to scroll through.



The Time column (SPLIT) is the running time beginning from the start, whereas the lap time (LAP) is the time of one single lap.



By pressing <*Microgate*> and confirming, the menu is closed.

If you want to begin a **New Test**, select the Simple Test icon again (or one of the other customized or predefined test types), whereas if you want to **continue the test** that you have just closed, use Continue in the Results menu, as described in chap. 5.2.

Now let's take a look at the various options that can be selected with the function keys:

5.1.1.1 New

The next athlete (or the next on the start list) is suggested but confirmation is needed. A number may be forced by entering the digits and pressing <*OK*>.

5.1.1.2 Delete Event

If an external element has interrupted a photocell causing an undesired impulse, the LAST EVENT (impulse) which has been received can be deleted by pressing <*F2*> Delete Event and confirmed by selecting Yes.

WARNING: The deleted item is always the last one, not the one highlighted in light blue in the table.

5.1.1.3 Ranking

Display the raking of the current Trial (or of a given trial). A certain athlete's test can be displayed and the list can be sorted by time or bib number (to find an athlete).

Use the <*up*> and <*down*> arrow keys to scroll the ranking and <*F1*> (or <*OK*>) to display the selected test (in this example the test of athlete number 1, Rossi).

5.1.1.3.1 View

View the selected test with all lap times (if present).

5.1.1.3.2 Sort

Sort the ranking by Time -<*F1*>- or Number (Bib) -<*F2*>-

5.1.1.3.3 Trial

Place the cursor on the 'Trial' dropdown menu in order to view a trial ranking or all trials together.

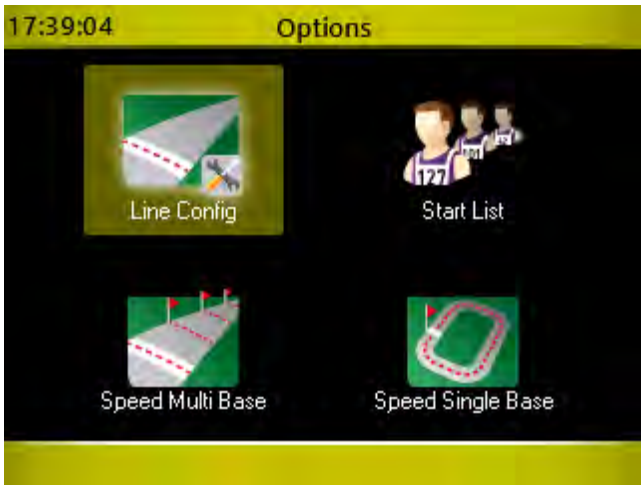
In this case the bib column (Num) has the format X.Y, where X is the bib and Y the trial (in the following example the athlete with the best time is athlete #1 in trial 1).

5.1.1.3.4 Cancel

Press <*F4*> Cancel to return to the timing screen.

5.1.1.4 Options

Recall a menu for configuring lines, speed bases, and start lists:

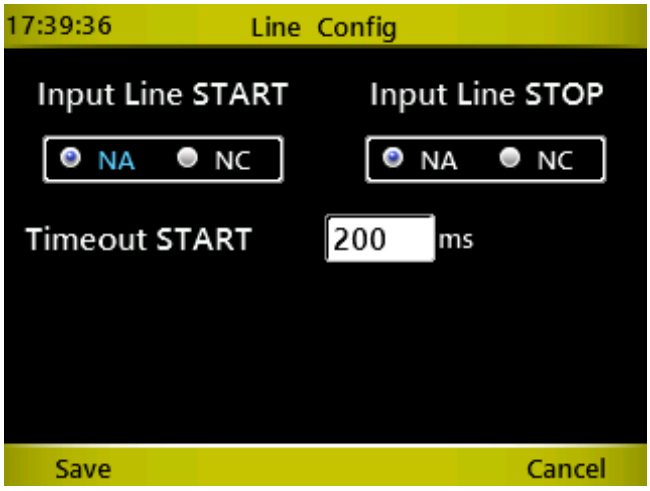


5.1.1.4.1 Line Configuration

Allows to configure the lines of possible peripherals connected via cable with the input jack on the back side.

It is possible to set the start and finish line to 'Normally Open' (NA) or to 'Normally Closed' (NC). For example a connected contact pad (Start Pad), which gives the start impulse when the athlete steps off it, is set to NC.

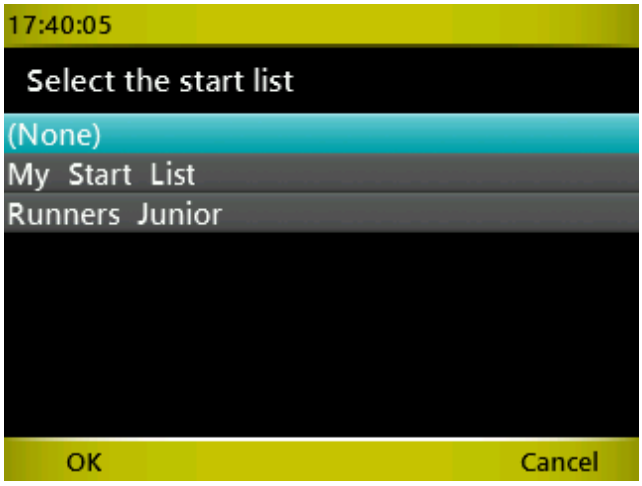
The start timeout is the so-called 'dead time'; setting it, for example, to 200 ms, after the start no other impulses will be considered within the first 2 tenths of a minute (this is useful to prevent false or spurious contacts).



5.1.1.4.2 Start Lists

If one or more Start Lists have been created with the Witty Manager software and transferred to the timer, with this option they can be chosen and used. From that moment the athletes will be placed in the order of the list and not of their bib number.

Choosing this option (None), the regular start order is used (1, 2, 3, 4, 5...).

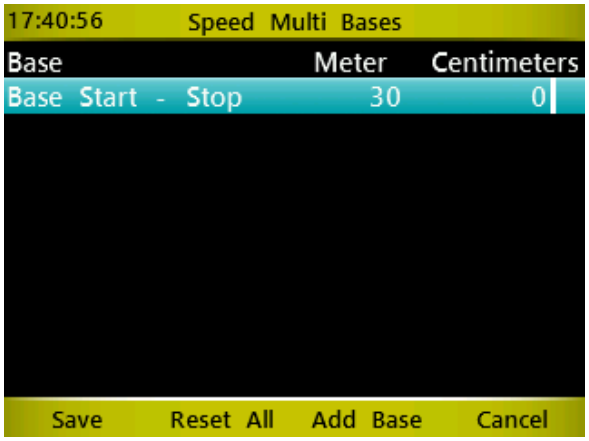


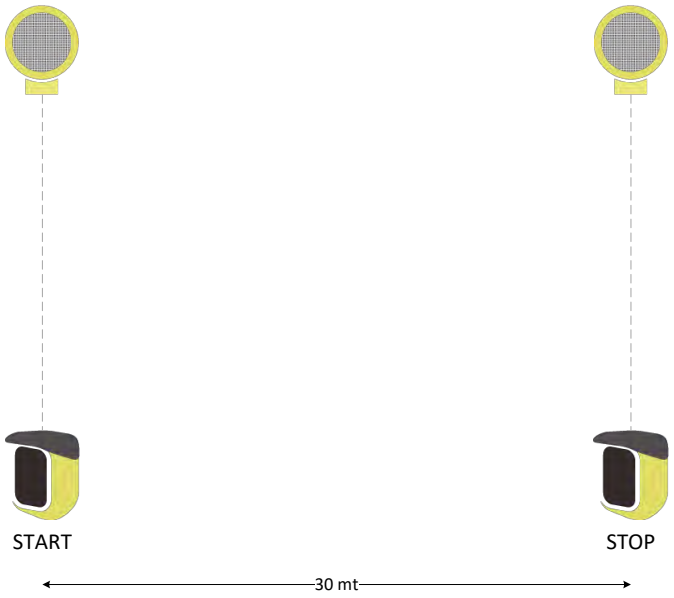
5.1.1.4.3 Multi Base Speed

This function (as well as the single Base) allows to define the distances between the photocells in order to determine the speed in the various trial laps. If the distances have been set in the time/lap table, the speed will be displayed (expressed in the chosen unit, see chap. 5.4.2.3).

The indication 'multi' does not mean that more than one base must be set. A classic sprint of n meters without lap can (and must) also be timed with this option. Let's see some examples:

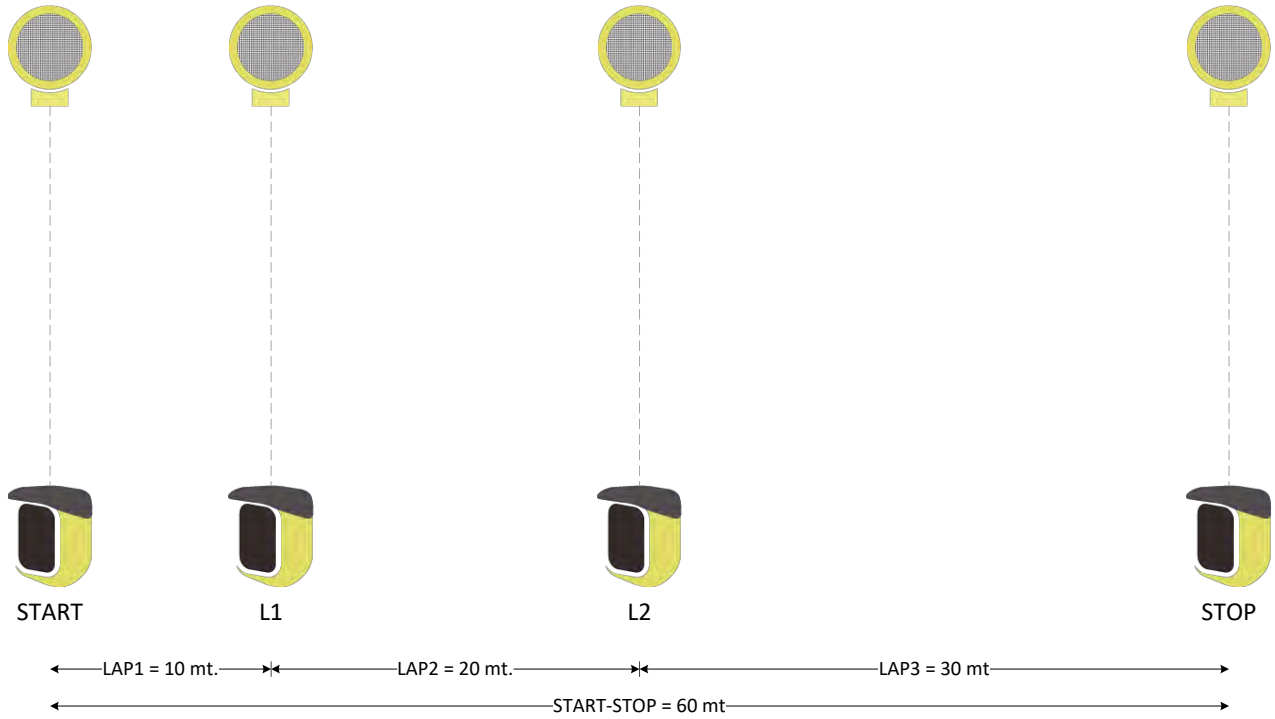
30-Meter Sprint with Only One Start And Stop

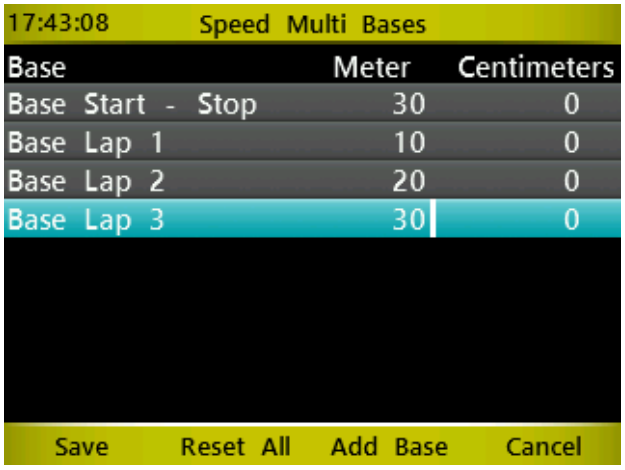




Set the distance (in meters/centimeters or feet/inches depending on the settings of the measuring unit) between start and stop and press *<F1>* Save.

60-Meter Sprint with Lap Time after 10 Meters and 30 Meters.





Enter the Start-Stop Base as in the previous example.

Then press <*F3*> to add the Lap1 Base and enter the distance.

Do the same for the Lap2 and Lap3 bases.

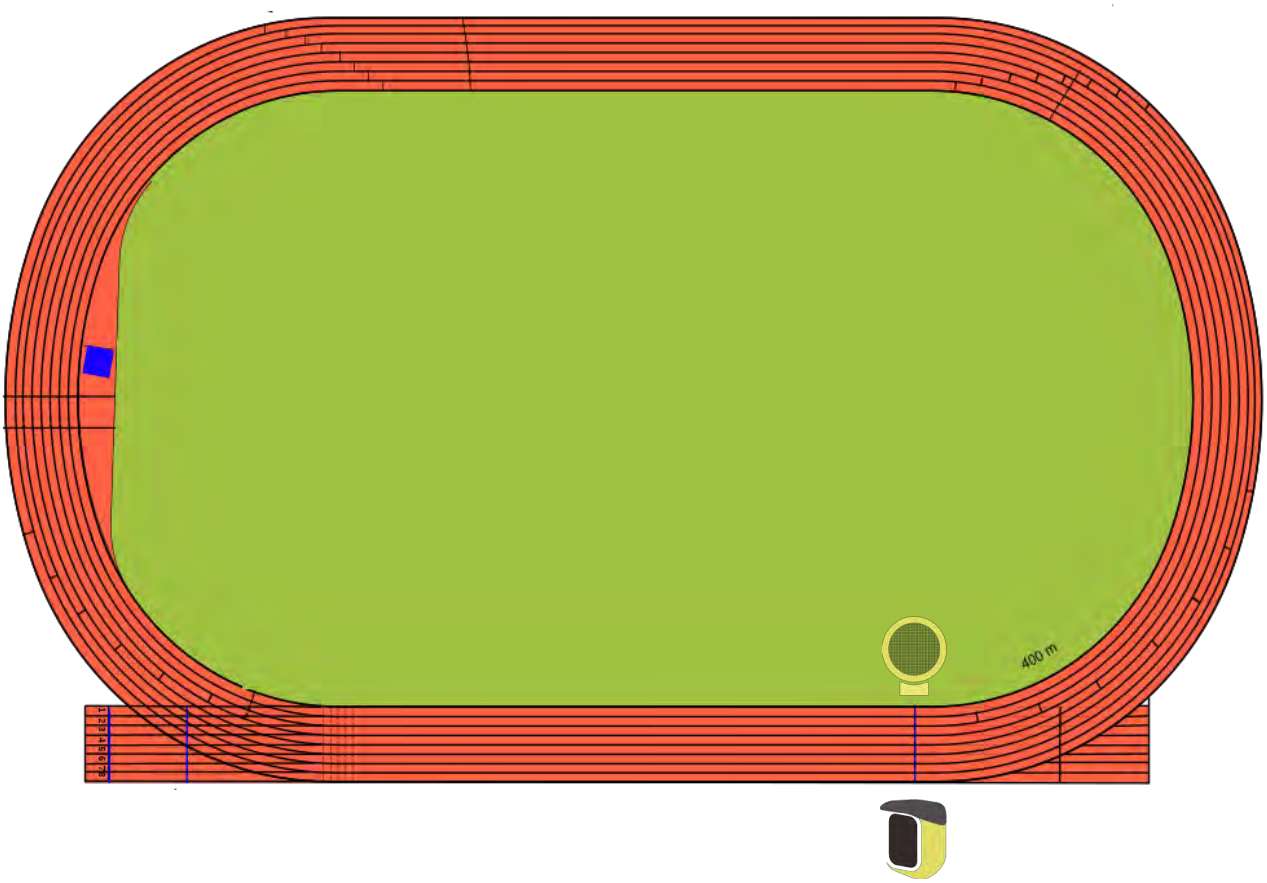
Remember to SAVE by pressing <*F1*>.

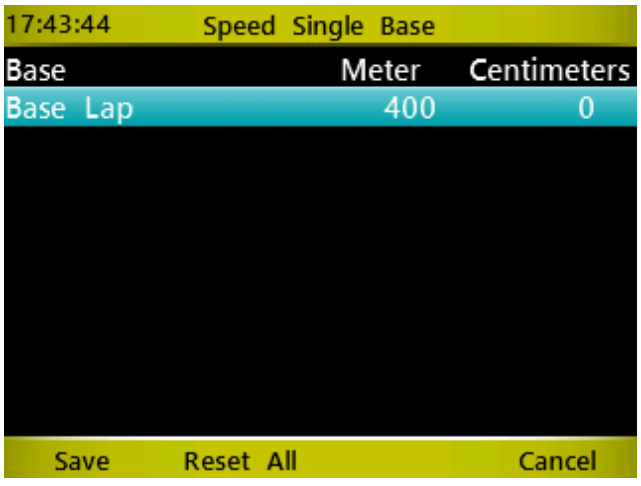
You can move around in the table to change the distance of a previously added Base.

To delete one or more bases, press <*F2*> to reset the list and enter new data.

5.1.1.4.4 Single Base Speed

This option must be used to set a Base with a single distance to be completed many times. A classic example is a 400-meter track, with a lap time and speed measured at every lap.





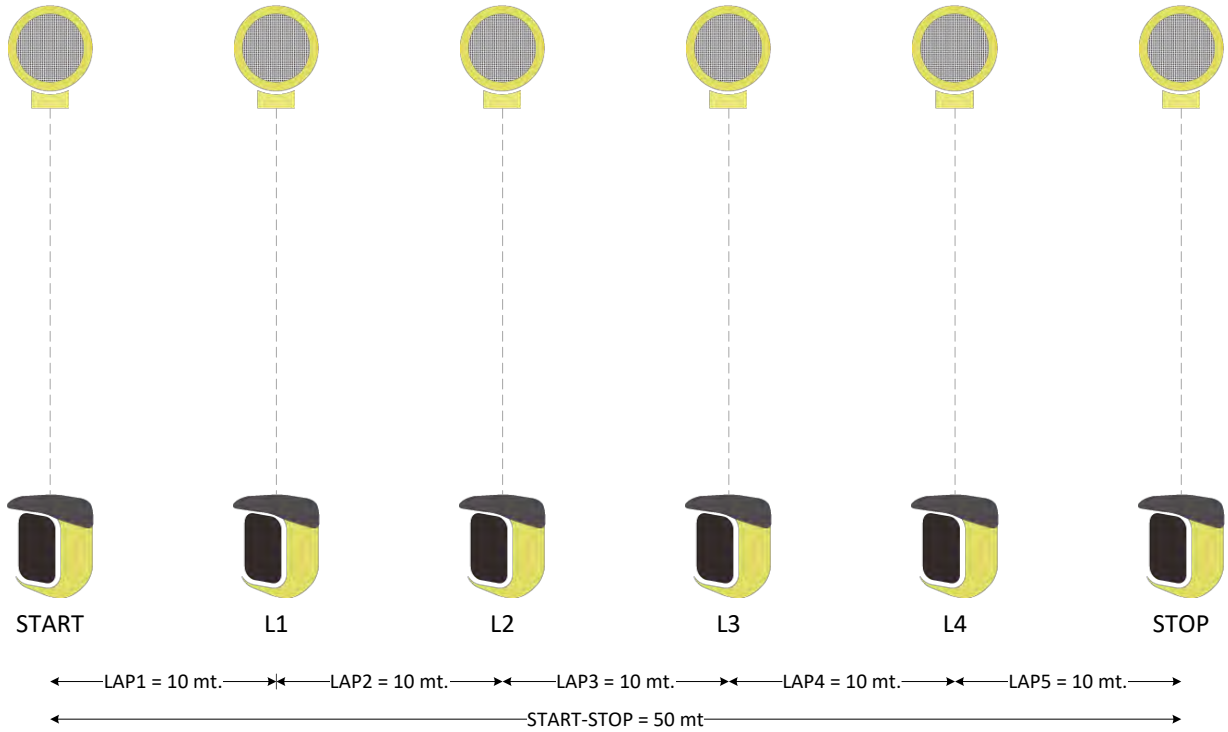
Enter the Base Lap by typing the distance.

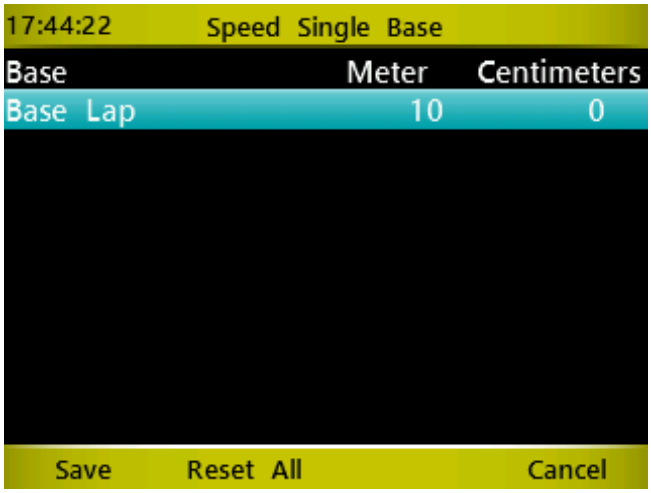
Remember to SAVE by pressing <*F1*>.

You can easily change the distance by typing it again or pressing <*F2*> to reset it and then enter the new data.

The Speed Single Base can be used also when there are several lap time measures at equal distances. In this case it is not necessary to define a multi base with equal distances, but it is enough to define the single base once, e.g.

50-Meter Sprint with 10-Meter Lap Time.

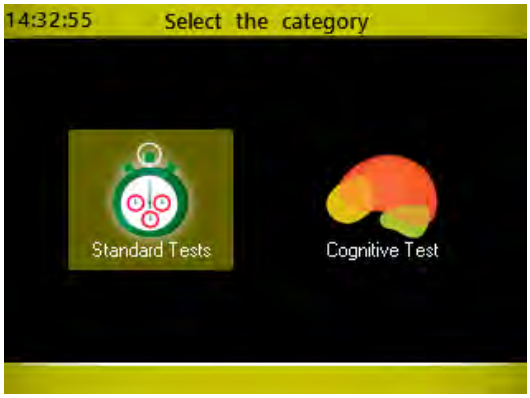




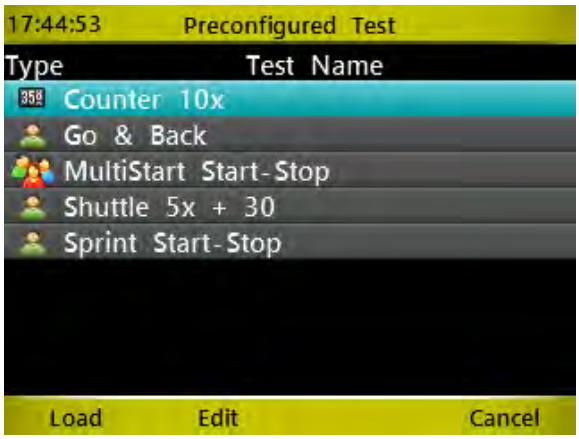
Enter the Base Lap at 10 meters and save by pressing <*F1*>.

5.1.2 Preconfigured Test

Select the macro-category of tests that you want to execute (for the Cognitive Tests, see chap. 4.4.6)



In the standard tests we have n types of tests among the most common ones that Microgate has chosen to provide as examples



The tests are defined as follows:

Test Name	Description	Defined as
Sprint Start-Stop	Sprint test with start and stop without lap times	Test Type: Basic Mode: In Line End of Test: Number of Impulse Number of Impulse: 1
Go & Back	Go and back test with 1 photocell	Test Type: Basic Mode: Go & Back End of Test: Number of Impulse Number of Impulse: 1

Shuttle 5x + 30"	Shuttle test with 5 repetitions and 30" recovery	Test Type: Basic Mode: Shuttle with recovery Number of Impulse: 1 Number of Repetition: 5 Pause Time: 00 mm 30 ss
MultiStart Start-Stop	Generic group test	Test Type: Multistart Max Time: (Undefined)
Counter 10x	Test with 10 repetitions	Test Type: Counter First impulse: No End of trial: Number of impulses Number of impulses: 10

5.1.2.1 Load

To begin a timing session of the desired type, select the line using the <*up*> and <*down*> arrow keys and press <*F1*> Load (or the <*OK*> key).

Now, thanks to these preconfigured tests, let's see an example for every test type:

5.1.2.2 Sprint Start-Stop: timing of a BASIC In-Line Test

The Test Base is this type of test; please refer to chap. 5.1.1 for further information.

5.1.2.3 Go & Back: timing of a BASIC Go & Back Test

The Go & Back test is also basically the same as an In-Line test; please refer to the latter for further information.

5.1.2.4 Shuttle 5x + 30": timing of a BASIC Shuttle Test

During the first sprint, the timer shows information as for an In-Line test; after crossing the stop photocell, a countdown starts for the amount of time set as recovery time:

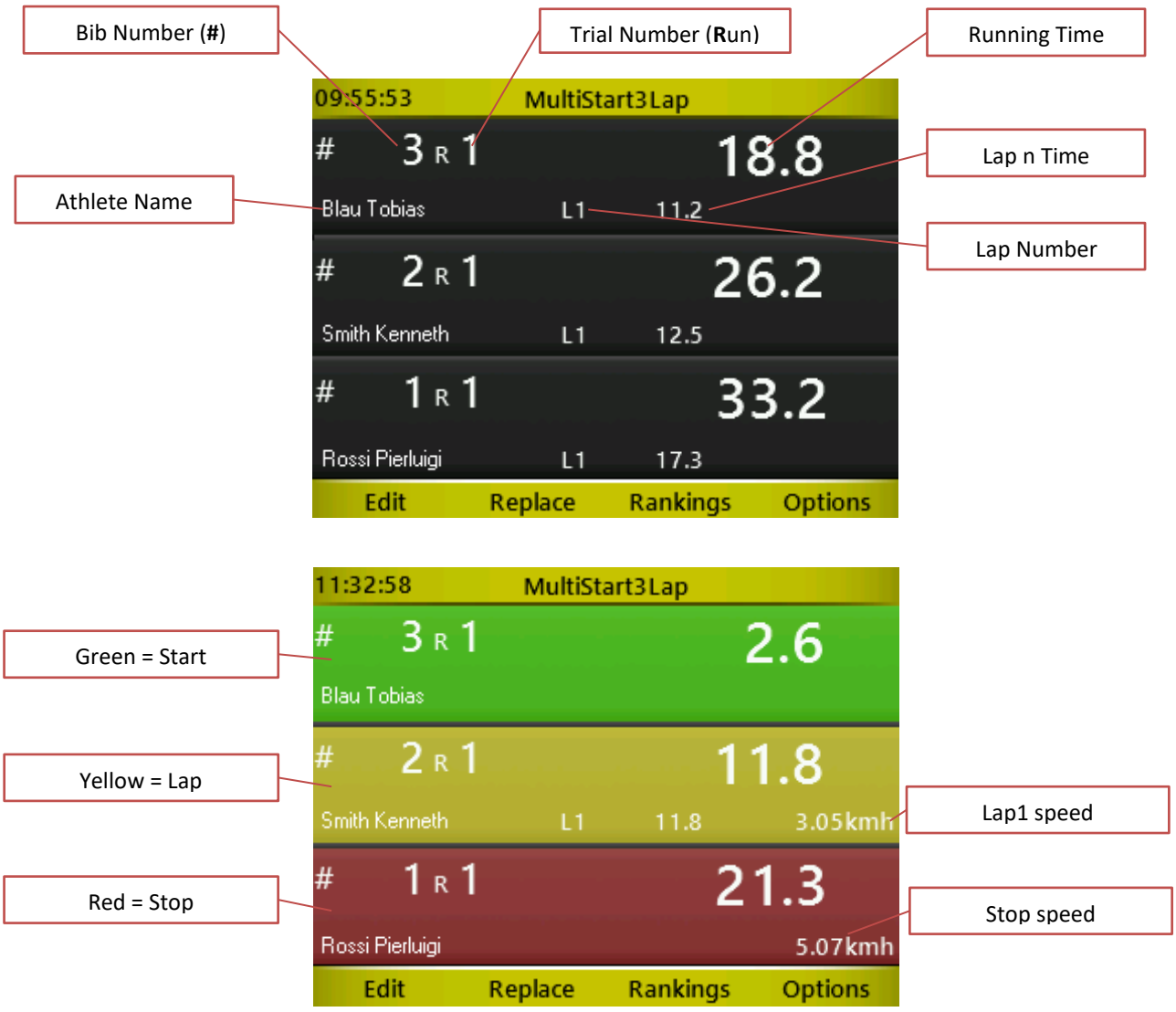
When the athlete starts again for the second sprint, the advance or delay (signaled by an intermittent beep) is calculated with respect to the recovery time; these times are highlighted on the data table with the letter

R (Recovery). In the example below the athlete has begun the second sprint with an advance of -1.4, and the third with a delay of +1.6.

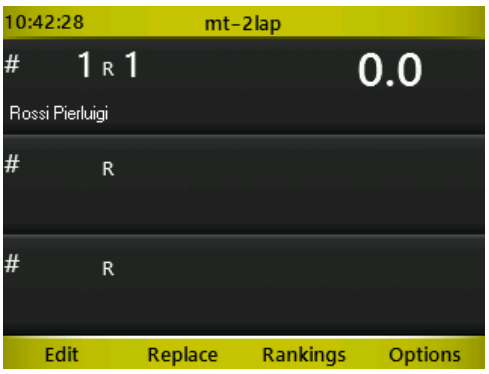
The ranking sums the times of n repetitions and does NOT consider the start delays or advances.

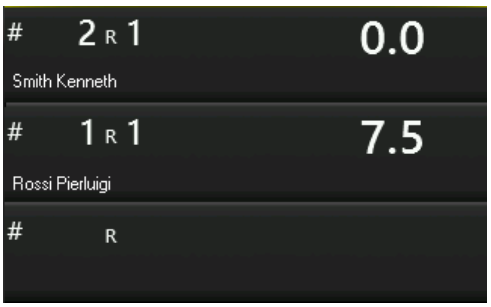
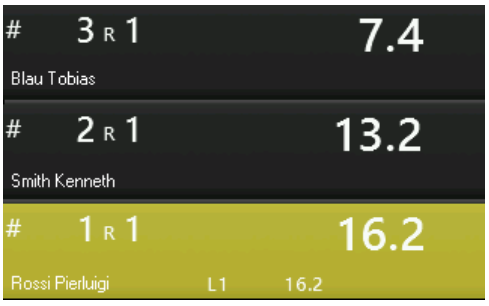
5.1.2.5 MultiStart Start-Stop: timing of a MULTISTART Test

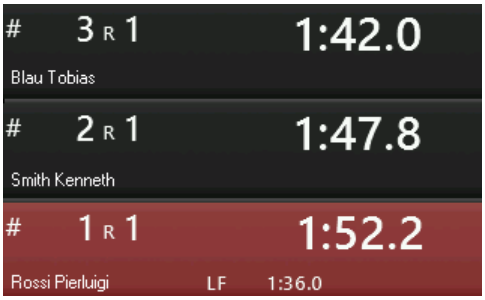
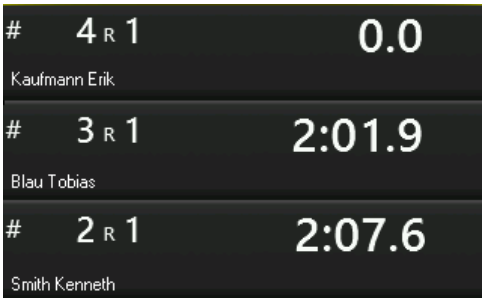
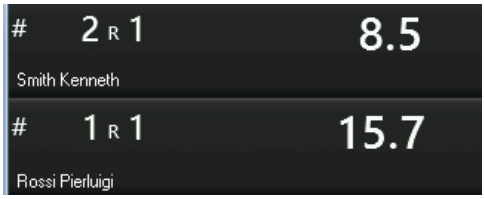
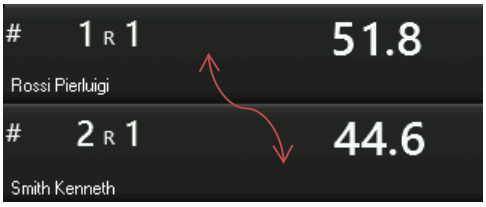
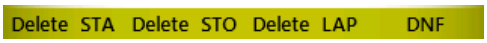
Now let's take a look at the user interface of a multistart timing test.

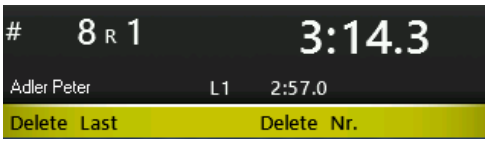
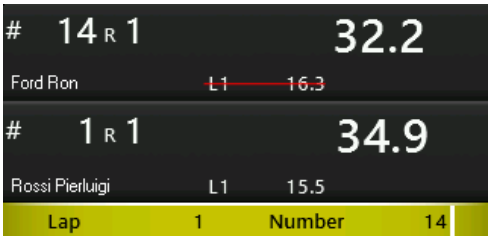


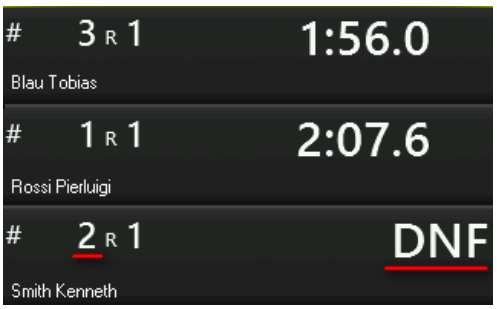
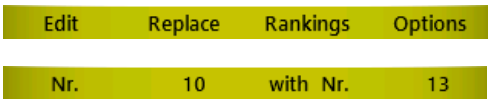
<table>
<tr>
<td>At the beginning of the test, athlete #1 is ready to start (or the first of the Start List, if one has been set).

If you want to force another bib number, just type it using the numerical keypad and confirm by pressing <<i>OK</i>>.</td>
<td> 
</td>
</tr>
<tr>
<td>If the photocells have not been configured in the test definition (see chap. 5.1.4), it must be done now. Press <<i>F4</i>> to access this option or other available options.</td>
<td>
</td>
</tr>
<tr>
<td>Athlete #1 starts, his sector becomes green for 5 seconds and then scrolls down to get ready for the next athlete.</td>
<td>

 
</td>
</tr>
<tr>
<td>Similarly, when number #3 starts, the first two athletes scroll down. If a LAP impulse is received, the sector of the athlete generating it turns yellow.</td>
<td> 
</td>
</tr>
</table>

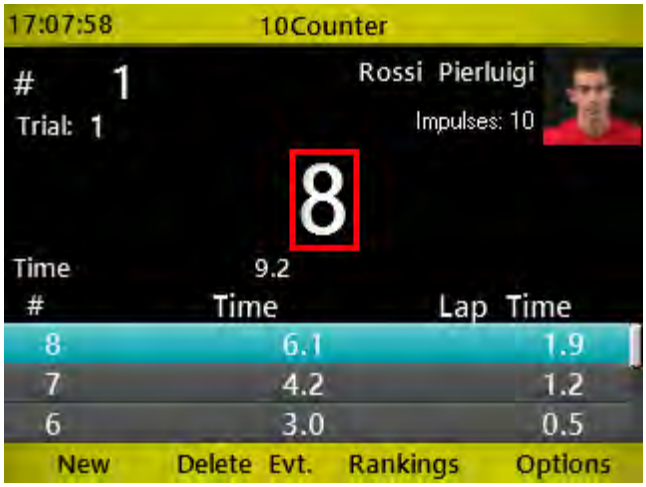
When the athletes cross the finish line (stop impulse), the final time is showed in red for 5 seconds and then disappears to show the next athlete starting.	 
If an athlete passes the athlete in front of him, the athletes can be changed on the fly, while they are running, using the <*up*> and <*down*> arrow keys. For example, athlete #1 started before #2... after approx. 40 seconds, passing takes place and the impulses must be assigned to #2. Just press <*down*> to replace the athletes (press <*up*> to replace them again).	 
It is also possible to delete undesired events or consider an athlete as 'Not Arrived'; press <*F1*> Edit to access the following options: <*F1*> Delete STArt <*F2*> Delete STOp <*F3*> Delete LAP <*F4*> NA (Not Arrived)	

Pressing one of the first 2 function keys, the last event of that type received (start or stop) is deleted. Confirmation is required and if you press Yes, the line status is reset to the previous status (if you delete a Start, the athlete is reset to the start, but if a Stop is deleted, his time starts running again).	
By pressing <*F3*> you can delete a Lap. You can choose to delete the last received Lap event or be more precise and indicate the Lap number and the athlete that it was assigned to. Press <*F1*> Delete Last to delete the last Lap (confirmation required) Press <*F3*> Delete Number and enter the Lap and Bib Number to delete a specific event (in the example Lap 1 of athlete #14 will be deleted).	 
If you want to 'disqualify' an athlete (or consider him 'not arrived'), just press <*F4*> NA in the Edit sub menu. If there are several simultaneous athletes, you will need to confirm the one to be deleted. Using the keys *F1* to *F4* select the bib of the athlete to remove (in the example #2) . Instead of the arrival time the writing DNF (Did not finish) is displayed.	

	
The writing DNF is also displayed if in the Multistart test definition a maximum time has been set for finishing the execution and one of the athletes has exceeded that time.	
The times of two athletes can be replaced using <*F2*>Replace. Enter the bibs of the athletes we want to replace. All times of the first athlete (#10) will be assigned to the second one (#13).	
Press <*F3*> Rankings to view the ranking.	

5.1.2.6 Counter 10x: timing of a COUNTER Test

The test starts when the first impulse is received and in the center the counter increases with every event. After 10 impulses (excluding start), the test is finished.



The options available with keys <*F1*> to <*F4*> are similar to the ones for the Basic Test.

5.1.3 My Tests

In this screen you will find all customized test types defined by the user (directly on the timer or via the Witty Manager software).

The icon in front of the name indicates the test type (Basic, Multistart, Counter).

5.1.3.1 Load

To begin a timing session of the desired type, select the line using the <*up*> and <*down*> arrow keys and press <*F1*> Load (or the <*OK*> key).

5.1.3.2 Edit

Allows to display the general settings of the test type or edit the Options (configuration of lines, speed bases and, for multistart tests, photocell configuration). Editing of definition parameters is not available, because if trials of that type were already carried out, it would not be possible to compare them with the new ones.

5.1.3.3 Delete

Delete the customized test type. Confirmation is required:

NB: Only the test definition is deleted; any possible trials of that type will NOT be deleted.

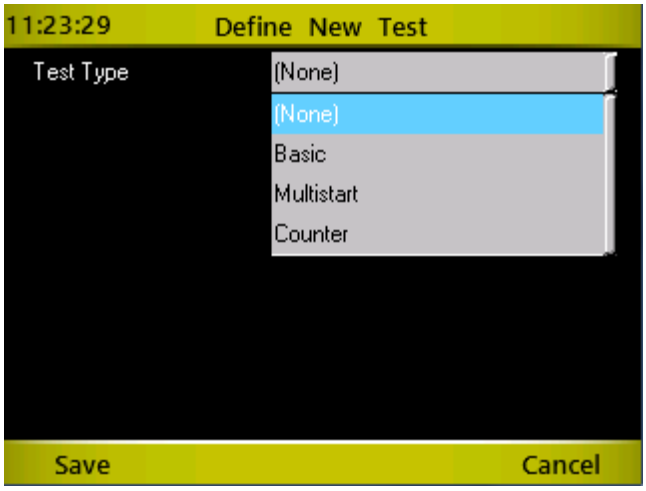
5.1.3.4 Cancel

Exit the previous menu.

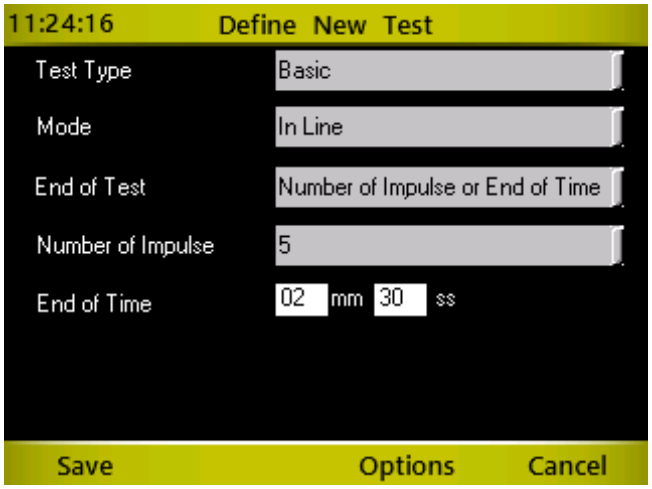
5.1.4 Define New Test

With this option new customized test types can be defined. Please refer to chap. 4 for further information on the various available test types and relevant options.

Choose the test macro type by pressing <*OK*> to open the dropdown menu, scroll up or down with <*up*> or <*down*>, and confirm with <*OK*>.

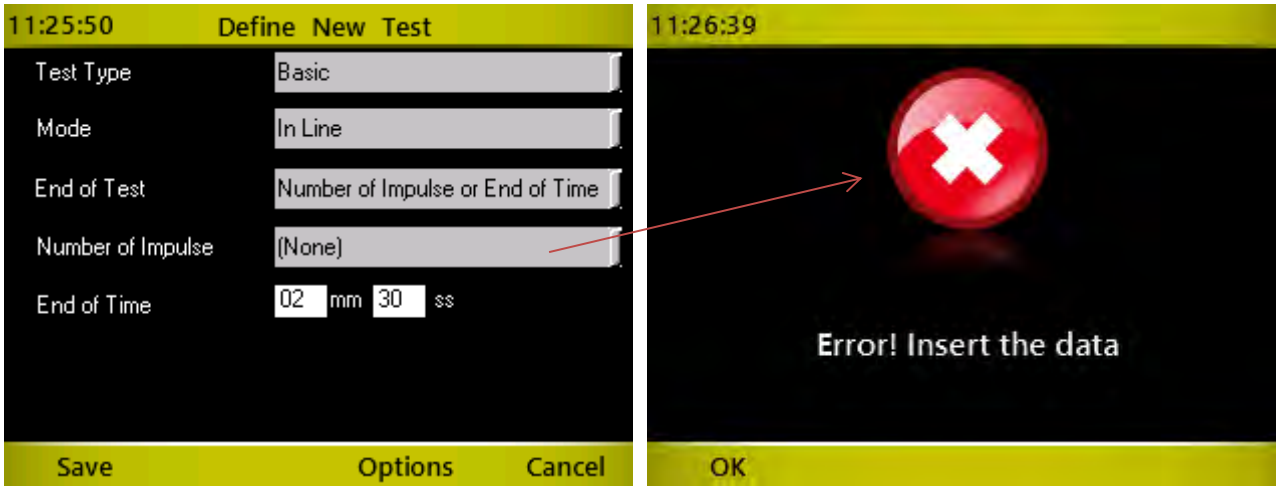


Depending on the chosen options, additional dropdown menus or numerical fields to be completed with the necessary information are displayed.



By pressing <*F3*> Options you can configure Lines and Speed Bases as explained in chap. 5.1.1.4. For MultiStart tests a menu item for configuring photocells will also be displayed.

Press <*F4*> Back to go back to the test definition.



Press <*F1*> to save the Test definition. A consistency check is carried out on the data and if any dropdown menu or field has not been filled, an error mask will warn the user. By pressing <*F4*> (after having confirmed) the screen is closed without saving.

If all fields have been completed correctly, after pressing Save the user will be asked to name the customized test definition.

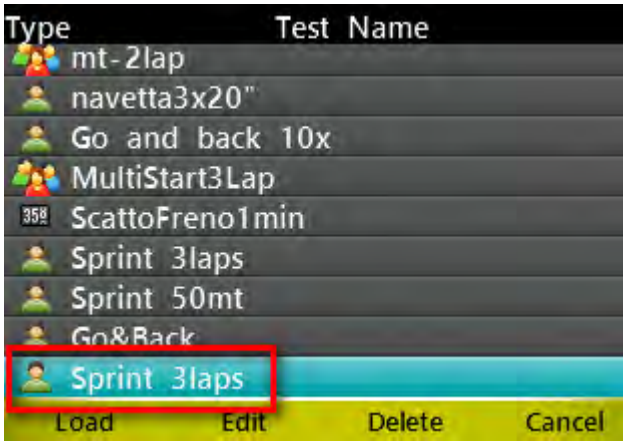
A name such as MyTest*TYPE*nn is suggested. For example, MyTest*Basic*1, MyTest*Counter*2, etc.

If the name is okay, confirm again by pressing <*F1*> Save, whereas if you want to change it to something easier to remember and more significant (recommended), use the virtual keyboard (remember that to make this easier it is possible to create definitions using the *Witty Manager* software and then transfer them via USB to the timer).

If you choose a name which has already been used in a previous test definition, the user will be prompted to choose another one (this happens also if you have deleted the previous definition but there are trials associated to that definition.

Please refer to chap. 2.4.1 for information on how to use the virtual keyboard.

After having saved the test with <*F1*>, it will be displayed with the same name in the list named 'My Test' (chap. 5.1.2).



5.2 RESULTS

This function allows to show the results of the tests carried out or to continue an interrupted trial.

The data table displays 3 columns with the following:

- the test type (Basic, MultiStart, Counter)
- the date and time of the test start
- the test name (predefined or customized basic test)

Possible Options are:

5.2.1 Show

By selecting a test with the <*up*> or <*down*> arrow keys and pressing <*F1*>Show (or <*OK*>) you access the trial ranking. The available Options in the ranking are similar to those in the previous chapters.

5.2.2 Continue

Access the timing screen of the selected test and continue the test from the last athlete ready to start (bib n+1, or the one selected from a start list, or the first athlete with trial number increased by 1).

5.2.3 Sort/Filter

Select this option to access one of the two sub-options (<*F1*>Sort, <*F2*>Filter); press <*F4*> to go back to the previous menu.

5.2.3.1 Sort

By selecting one of the three Options (<*F1*>By Type, <*F2*> By Date, <*F3*>By Name) the result list is sorted by the selected column.

Sorting **by Type** the order is the following: Basic, MultiStart, and Counter.
By Date sorting is descending (most recent tests are at the top of the list).
By Name sorting is alphabetical.

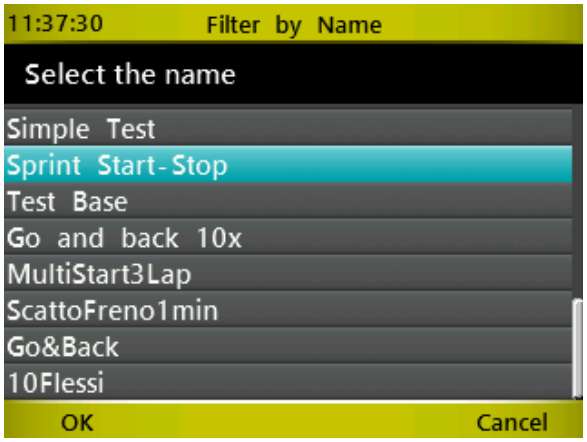
5.2.3.2 Filter

In case of many tests it is possible to browse (filter) the list by test name or by date range (from... to...). The filter remains active even if you exit the main menu and then enter the Results item. To reset it and display all records, see chap. 5.2.3.3

An icon beside the column for which the list has been filtered (Test Name or Date) indicates that there is an active filter.

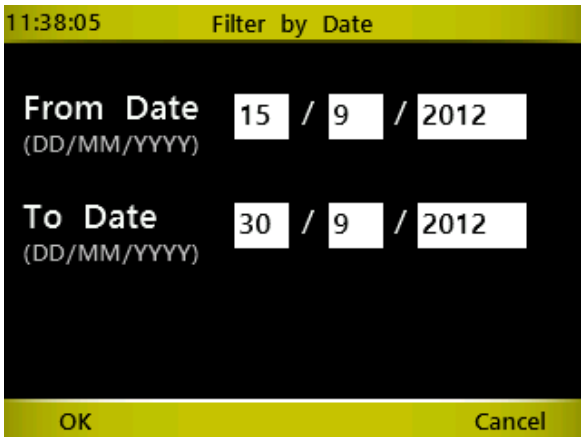
5.2.3.2.1 Filter by Name

A unique list of all present test names in the result list is displayed. Choose a name from the list by selecting it and pressing <*F1*> or <*OK*>. The Result List displays only the trials of that given type.



5.2.3.2.2 Filter by Date

Enter two dates (the second identical or subsequent to the first one) to find the trials carried out during that period of time. The filter is NOT cumulative (i.e. any filter by Name previously entered will be reset).



5.2.3.3 Reset Filter

Resets all set filters and shows the complete result list.

5.2.4 Delete

Deletes the selected trial. Confirmation is required.

WARNING: If the results have not been transferred to the PC via the *Witty Manager* software, the trial will be irreparably deleted and it will not be possible to recover it.

5.3 ATHLETES

If the athletes' personal data has been transferred via the Witty Manager software, this function allows to display them.

Accessing the Athlete List menu the list of available athletes with bib, name and birth date will be displayed.

5.3.1 Show

Displays the athlete's personal data, including the picture and notes (if present). Press <*F4*> or <*Microgate*> to go back to the list.

5.3.2 Sort

Press <*F2*> to display the various sorting options: <*F1*> = by name, <*F2*> by bib.

5.3.3 Delete

An athlete can be deleted from the list; therefore if his bib number is entered, it will not be associated to that name. Any tests that have already been carried out by that athlete are NOT deleted and will be associated to that name (i.e. the athlete's data is always written in the test, not only a link between the trial and the athlete is kept).

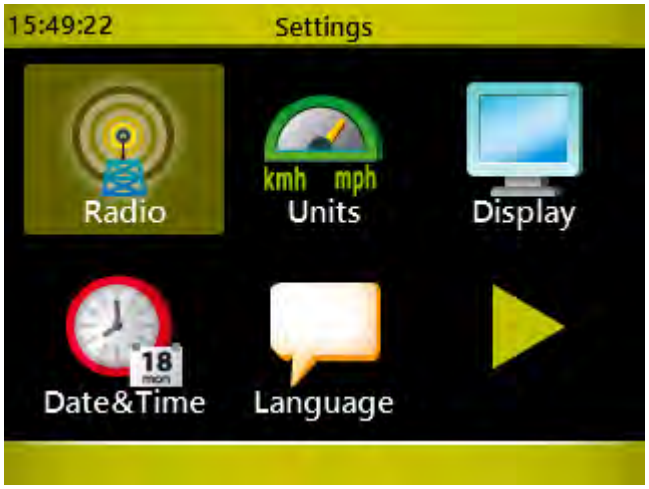
5.3.4 Cancel

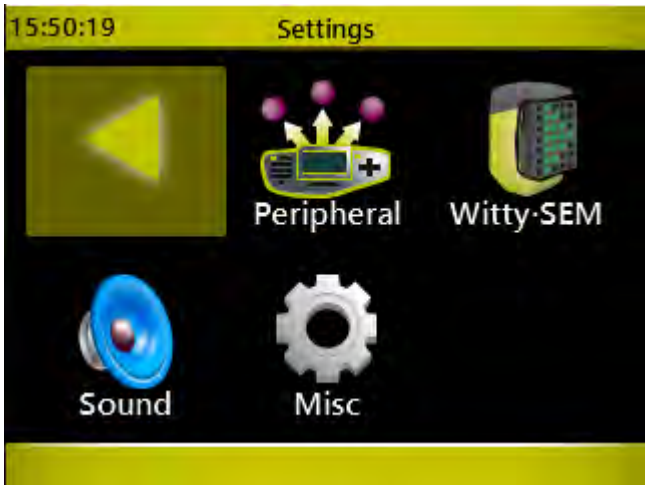
Go back to the main menu.

5.4 SETTINGS

This option allows to set and configure several parameters of the Witty system.

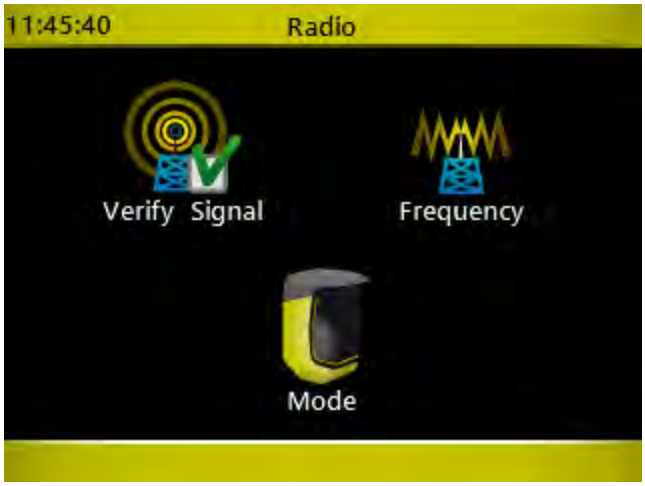
Use the triangle-shaped "next/previous" icon to go from one screen to the next or to the previous one.





5.4.1 Radio

In this section the wireless transmission between the Witty timer and the photocells is configured.



5.4.1.1 Verify Signal

Once you enter the Verify Signal section, the timer awaits an impulse from the photocells, from Witty·SEM or Witty·RFID.

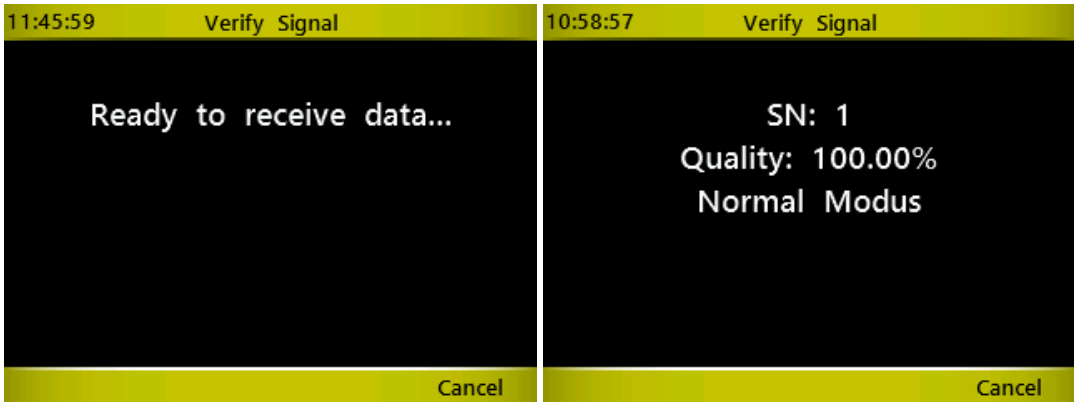
Interrupt one photocell after the other with your hand to verify that they are functioning correctly.

After having received the impulse, the serial number of the photocell, the signal quality (100% = excellent), and the mode (*normal* or *strong*) to which it is set are displayed (see chap. 5.4.1.3).

If Witty does not display anything, it is possible that the transmission channel of the timer and the photocell differ. Please refer to chap. 5.4.1.2 to set the correct channel.

Regarding the Witty·SEM signal test, Witty·SEM puts itself in on-hold status and shows its index (A, B, C…) in red color; please put your hand close to the Witty·SEM to test the signal quality.

Regarding the Witty·RFID signal test, please put one of the RFID tag close to the RFID so that the test signal starts: besides signal quality percentage, the recorded bib number and the Radio Power mode (Normal/Short) will also be shown.



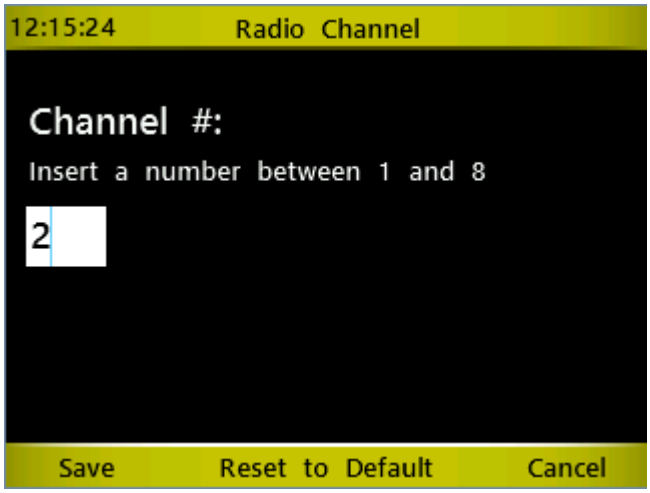
5.4.1.2 Frequency

To prevent frequency collisions with other Witty Kits on the field, it is possible to change the transmission channel (of both the timer and photocells, which must of course have the same channel).

Put the n photocells that must be set into 'configuration mode': turn off the photocells and then press and hold the on/off button for 5 seconds (see chap. 2.2.2). When all photocells have a red blinking status LED, on the Witty timer enter the channel number using the numerical keypad (from 1 to 8) and press Save (*F1*).

The photocells, which have just received the command, emit a two-tone beep, restart and are turned on in normal mode. Use the Verify Signal function (chap. 5.4.1.1) to ensure that the channels have been set correctly.

The "Reset Default" (F2) button resets the initial photocell conditions, i.e. Mode=*Normal* and RadioPower=*Normal*, Activation Mode =*Normally Open* (see the following chapter; activation can be changed only using the Witty Manager software).

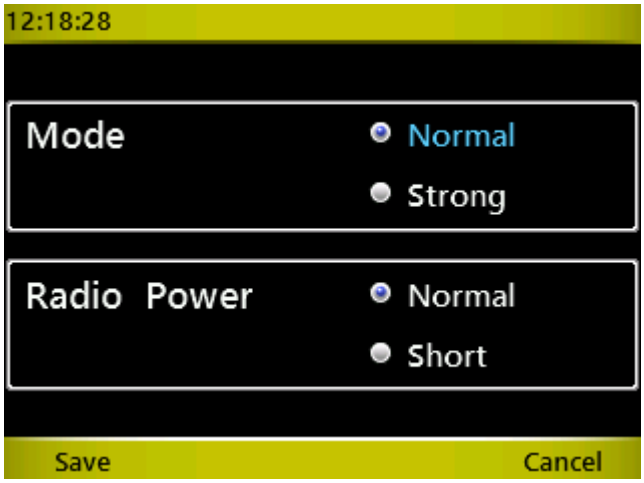


The same applies to Witty·SEM e Witty·RFID accessories.

5.4.1.3 Photocell Mode

The photocells can be configured to function with two different modes depending on the minimum and maximum distance between them and the reflector and with 2 different “radio-power” mode (see chap. 2.3.1)

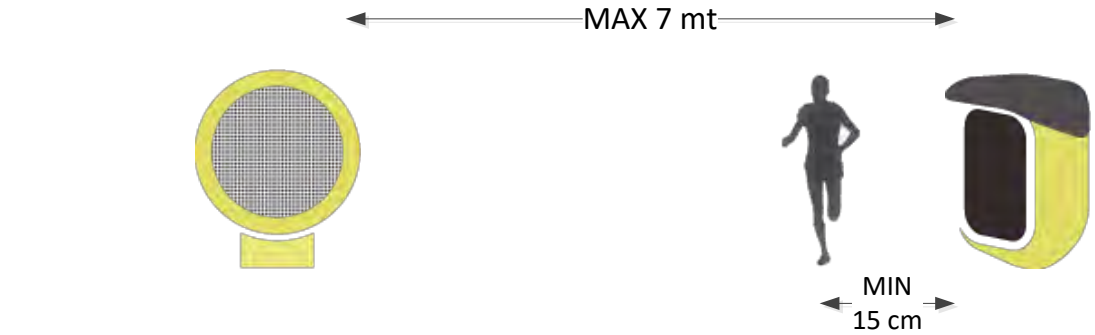
To set one of the two modes, proceed as if changing the channel: put the photocells in configuration mode (when switched off press the On button and hold it for 5 seconds, see chap. 2.2.2), on the Witty timer choose one of the two modes and press *OK*. The same two-tone beep as before signals that the signal has been sent.



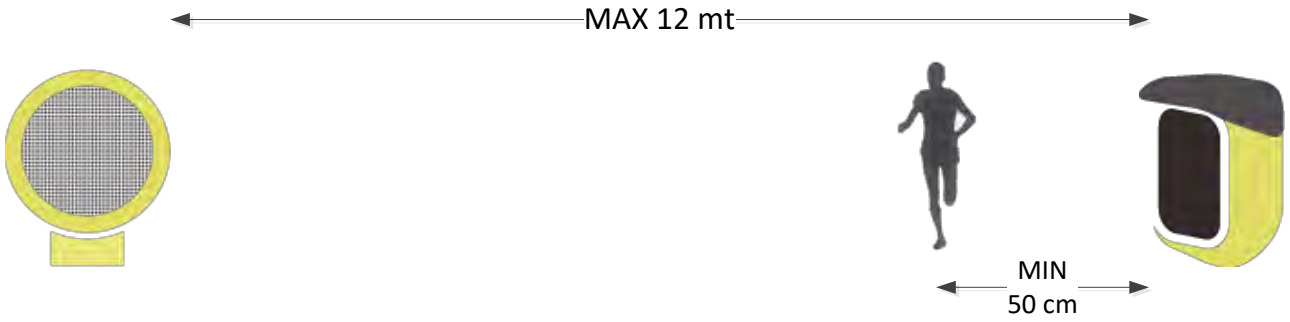
5.4.1.3.1 Mode

Depending on the position of the two tripods (e.g. outside the 8 lanes of an athletics track) and how close to the photocells the athletes will pass, the photocells can be set as follows:

In 'Normal' mode the maximum distance between photocell and reflector is 7 meters, whereas in 'Strong' mode it is 12 meters. The latter, though, does not record passages, if the athlete passes too close to the photocell (minimum distance of 50 cm).



Normal Mode



Strong Mode

5.4.1.3.2 Radio Power

The Radio Power parameter indicates the duration of the impulse transmission set for “Normal” mode at 1.2 sec. and for “Short” mode at 0.4 sec.

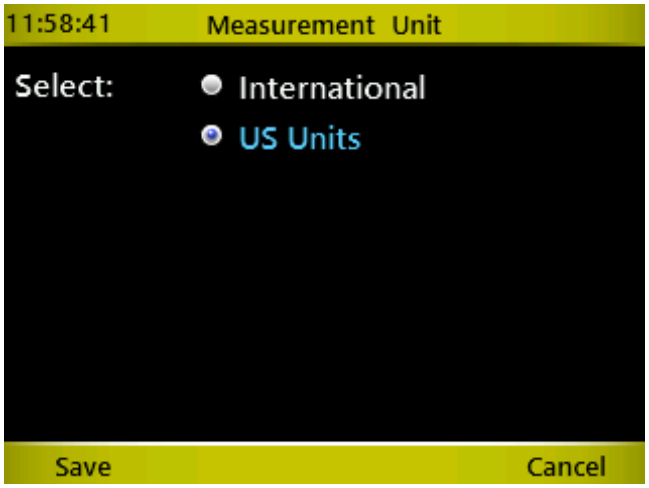
As explained in chapter 2.3.1, lowering the impulse duration (setting Radio Power to "short") has some advantages if there are two photocells, which are very close one to another, but decreases the transmission quality in the long run and therefore system reliability.

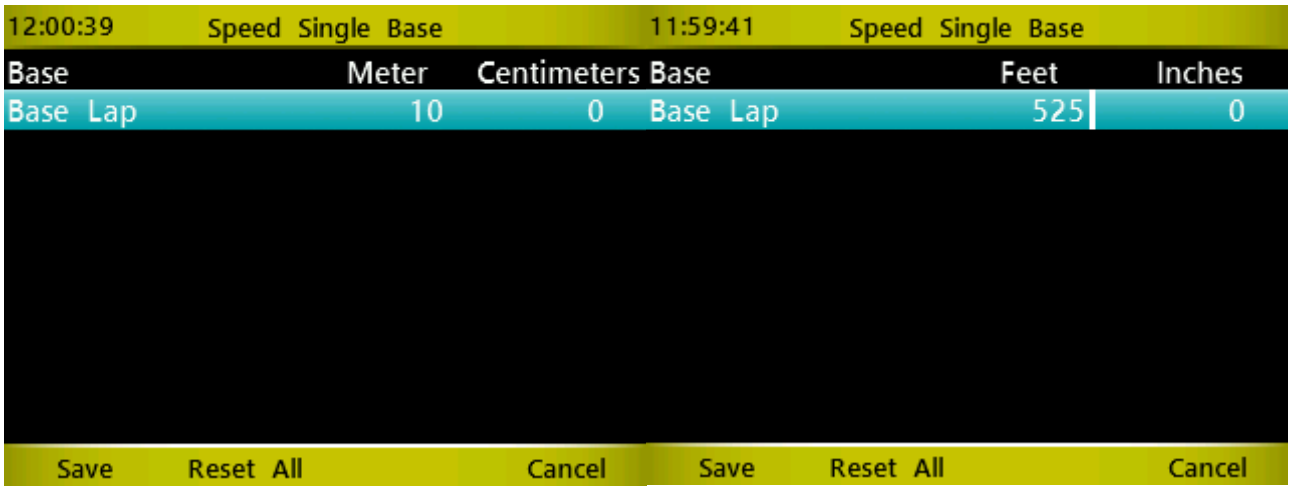
5.4.2 Units

In this section it is possible to set the measurement unit for distances and speeds, and time displaying accuracy.

5.4.2.1 Measurement Unit:

Choose International or US Units as measurement unit type. This choice affects the measurement unit for distances and Speed Bases (International = Meters/Centimeters, US Units = Feet/Inches).



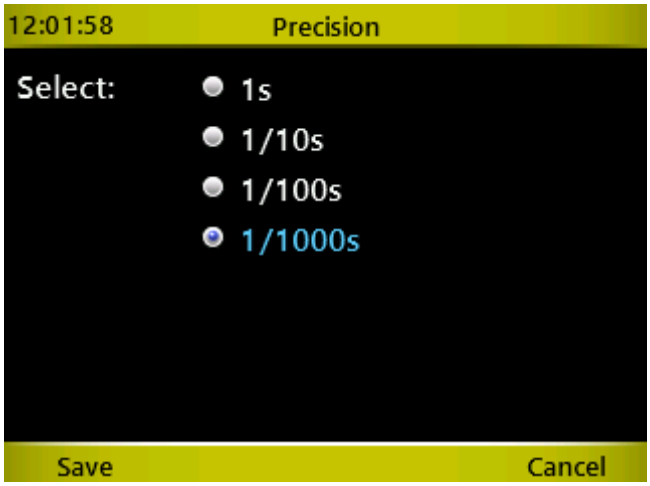


5.4.2.2 Precision

Choose the time displaying accuracy (seconds, tenths, hundredths, or thousandths) for timing, rankings, and result lists.

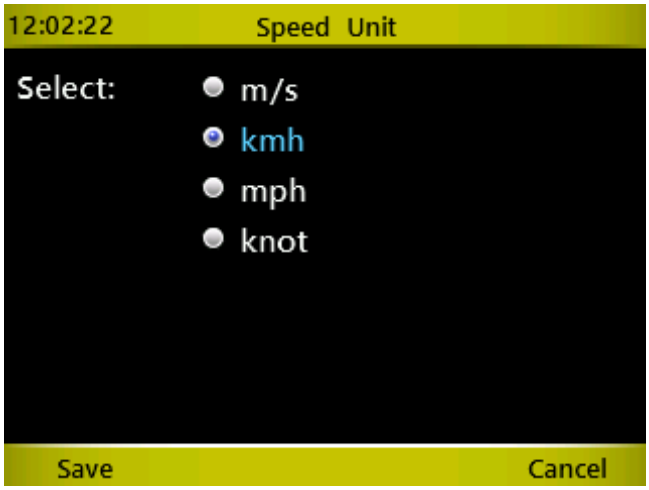
It is important to know that this configuration sets only the *displaying* of times, which are always calculated as accurately as possibly, regardless of the configuration (1/25000 seconds).

Similarly data exporting to PC via WittyManager software is also always carried out with the highest accuracy and will not be affected by this function.



5.4.2.3 Speed

Enter the measurement unit (choosing between meters per second, km/h, miles/hour, and knots) for displaying the speeds, if the lengths have been entered in the relevant bases.

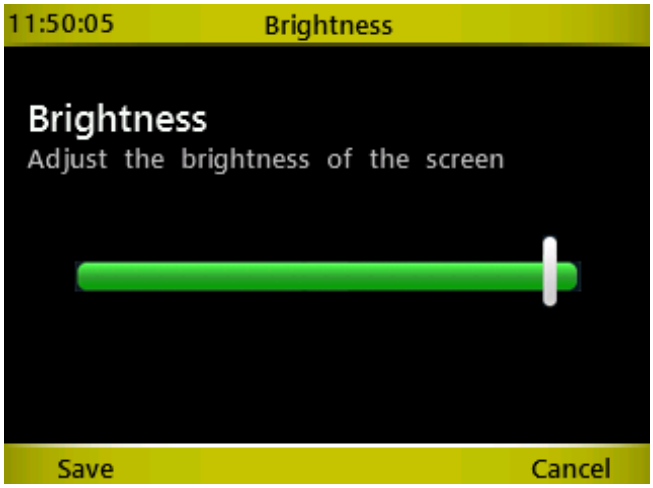


5.4.3 Display

Functions for setting the display brightness and its automatic reduction time.

5.4.3.1 Brightness

Adjust the display brightness depending on the ambient conditions (e.g. in direct sun light it must be increased, whereas indoors it can be decreased to ensure longer battery life).



Press the right and left arrow keys to move the slider; press <*F1*> (Save) to confirm and exit. <*F4*> (Cancel) exits the function without changing the brightness configuration previously set.

5.4.3.2 Screen Time-Out

Set the time of inactivity after which the screen reduces its brightness to 5% (it is not turned off completely).

Using the up and down arrow keys choose an option and press <*OK*>. Press <*F1*> to save or <*F4*> to cancel.

After the set time (from the last operation carried out) has elapsed, the screen reduces its brightness to 5%. To reset it, press any key.

5.4.4 Date & Time

Functions for setting the Date, Time, and Format.

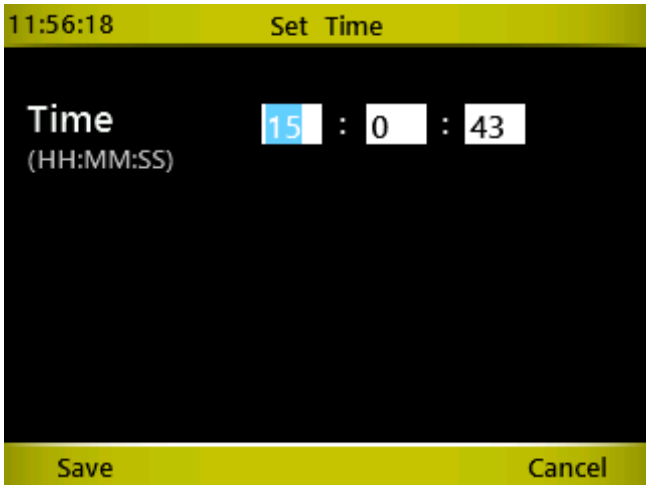
5.4.4.1 Set Date

Enter Day, Month, and Year using the numerical keypad. Press <*OK*> to toggle between the fields. Press <*F1*> to save the data.

For dates containing incorrect values (e.g. day > 31 or month > 13) the user will be prompted with a relevant mask. Press <*F1*> to correct the invalid values.

5.4.4.2 Set Time

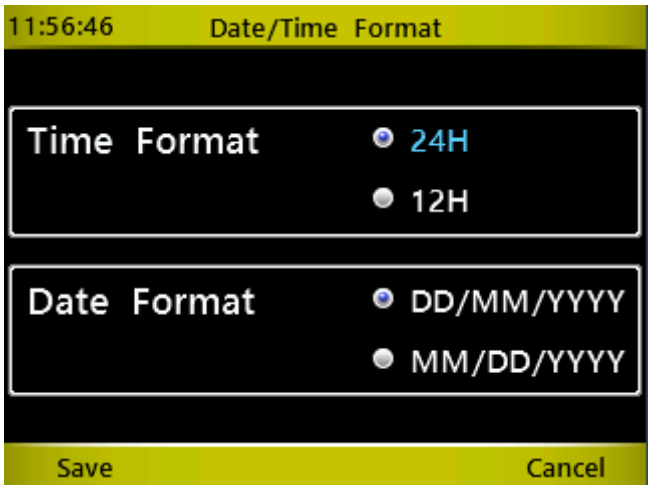
Enter Hours, Minutes, and Seconds using the numerical keypad. Press <*OK*> to toggle between the fields. Press <*F1*> to save the data.



For time containing incorrect values (e.g. hours > 24 or minutes > 60) the user will be prompted with a relevant mask. Press <*F1*> to correct the invalid values.

5.4.4.3 Date/Time Format

Choose the Hour (24H/12H) and Date Format (international/American) using the <*up*> and <*down*> keys and confirm by pressing <*F1*> Save.



WARNING: this configuration sets only the viewing in Results. Setting of date and time on the timer, as explained in the chap. 5.4.4.1 and 5.4.4.2, is always in international format.

5.4.5 Language

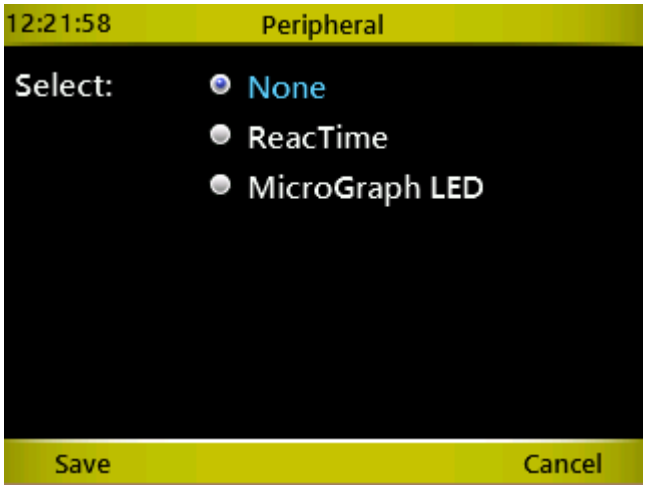
Select a language among the ones available to be used in the Witty timer user interface.

5.4.6 Peripherals

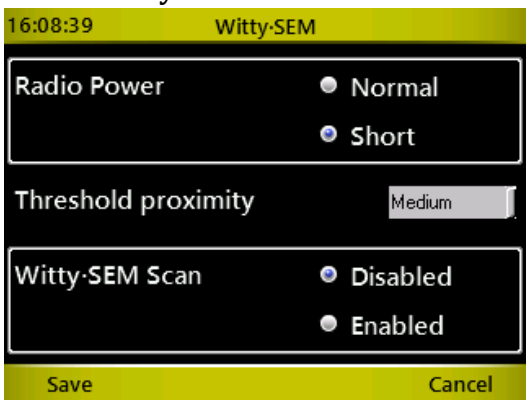
The external line input (green 3.5 mm jack on the back side of the timer) can be used to connect a series of peripherals, such as

- ReacTime by Lynx (false start and reaction times for track and field)
- MicroGraph LED display board (graphical LED display board)

If using one of these peripherals (with a specific cable), choose one and press <*F1*> Save.



5.4.7 Witty·SEM



This is used to set two parameters relative to the Witty·SEM traffic lights. Select the options and press <*F1*> Save. The values are stored in the timer and sent to the traffic lights for each test. Therefore it is not necessary to place the traffic lights to be set in configuration mode.

The **Radio Power** parameter indicates the duration of the impulse transmission set for “Normal” mode at 1.2 sec. and for “Short” mode at 0.4 sec. (see chapter 2.3.1).

The “Proximity threshold” parameter can be set to “close”, “medium”, “distant” and indicates the approaching distance necessary to trigger the proximity sensor. As the sensor is influenced by the reflectivity of what interrupts it and by the background that surrounds it, it is not possible to indicate fixed distances for the three values that depend on ambient conditions.

The third parameter “**Witty·SEM** Scan” is perhaps the most important: if it is set to "Disabled" the Witty timer expects the number of semaphores active to be equal to the number entered during test set-up, and that the semaphores are progressive ID (A, B, C, D,…). If this is not the case (e.g. using 3 semaphores when in test set-up 4 are entered, or using semaphores with ID A, B, D, F) the behaviour of the devices is anomalous and the test will not be carried out correctly.

To avoid this potential problem, the option can therefore be enabled to force the timer to scan all the semaphores present in the area. If the number of semaphores it finds do not correspond with the test set-up, it notifies the user and asks if it should continue.

In addition, if the device IDs are not consecutive, the test is carried out correctly as though they are. It should be noted however that, as the area needs to be scanned each time a test is started, there are a few seconds delay between the test loading and starting.

In summary:

Parameter Witty·SEM scan	Sem number that must be equal to the Definition Test	Device ID for the semaphores must be consecutive (A, B, C. D,…)	Scan standby at the beginning of the test
Disabled (default)	YES	YES	NO
Enabled	NO	NO	YES

5.4.8 Sound

Enables or disables the beep tone emitted when pressing a key.

Using the <*up*> and <*down*> arrow key select one of the two options and press <*OK*>. Press <*F1*> to save or <*F4*> to cancel.

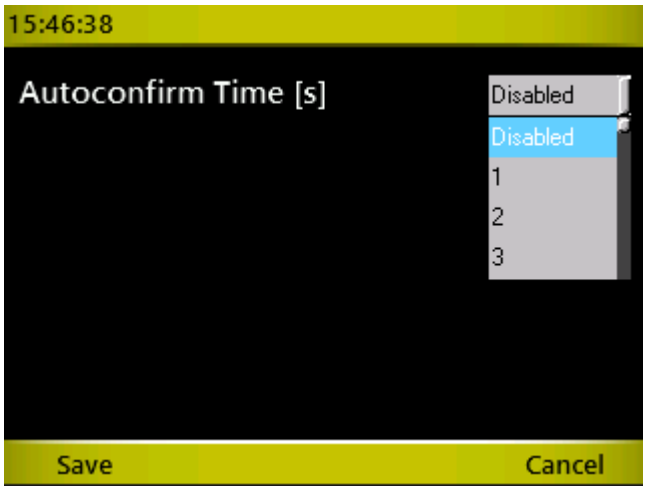
5.4.9 Miscellaneous

The menu currently includes only one option relating to the automatic confirmation time.

If the option is set on anything but "Disabled", when an athlete finishes a test, the timer is automatically positioned on the next athlete's number after the number of seconds indicated.

When the timer knows that the test is finished and the next athlete can begin, the test must be configured to receive a STOP, then, for example, the “Test Base” described in chapter 5.1.1 is not one of these and continues to need manual intervention using the key *<F1> New* to move onto the next athlete. The “Sprint Start-Stop” Test (chap. 5.1.2.2), on the other hand, is an example of a test where the second pulse received is of the type “Stop” and therefore automatic advancement is possible.

The next athlete proposed by the timer is obviously not always the athlete number N+1, as was previously the case, but the Start List is taken into account, as explained in chap. 5.1.1.4.2



6 CONNECTING TO A PC VIA *WITTY MANAGER*

Witty Manager is a PC software for MS Windows (Win7/8/10) for managing the trials timed with Witty, displaying rankings, graphs, histories, etc.

The main functions are:

- managing Athletes' Personal Data including pictures and divided into groups of categories
- managing the Start Lists
- creating Customized Test definitions
- downloading data from Witty and displaying Results in highly configurable tables and graphs
- updating the Witty and photocell firmware

For all details and user instructions, please refer to the User Manual of the software.

7 TECHNICAL DATA

7.1 WITTY TIMER

Weight	337g, battery included
Dimensions	214 x 100 x 36 mm
Operating temperature	0°C to +45°C
Unit of time measurement	Selectable 1 s – 1/10 s – 1/100 s – 1/1000s Selectable speed m/s – km/h – mph - knots
Measurement resolution	4 x 10^{-5} s (1/25000 s)
Display	Graphic color TFT display, visible area 59x44 mm, 320x 240 pixel, with backlight adjustment via software
Radio module	Multi-Frequency Transceiver 433-434MHz
Radio transmission	Digital FSK transmission; redundant code with information correctness verification and auto-correction
Radio frequencies	433.050 MHz to 434.790 MHz
Radio transmission power	10 mW
Processing unit	Two 32-bit microprocessors
Time base	12 quartz 8 MHz, stability ±10ppm between 0°C and +45°C
Power supply	Internal polymer lithium battery, external power supply 5VDC
Battery charging	Integrated intelligent charging device
Battery life	> 10 hours
Keypad	23-key membrane keyboard • Start-Stop keys • Numerical keypad • 4 function keys • 4 arrow keys and selection key • Home key • Key for line blocking
Connections	• MICRO USB type B connector for charging and connecting to a PC • Jack connector for external input
Distance between antenna and human body	• > 5mm

7.2 WITTY GATE PHOTOCELL

Weight	169g, battery included
Dimensions	75 x 103 x 48 mm
Operating temperature	0°C to +45°C
Minimum resolution	0.125 ms
Delay with respect to the event	1 ms
Optical range	12 m
Radio module	Multi-Frequency Transceiver 433-434MHz
Radio transmission	Digital FSK transmission; redundant code with information correctness verification and auto-correction
Radio frequencies	433.050 MHz to 434.790 MHz
Radio transmission power	10 mW
Impulse transmission accuracy	±0.4 ms
Radio transmission range	Approx. 150 meters
Processing unit	16-bit microprocessor
Time base	8 MHz quartz, stability ±30ppm between 0°C and +45°C
Power supply	Internal lithium ion battery, external power supply 5VDC
Battery charging	Integrated intelligent charging device
Battery life	> 10 hours
Connections	• MICRO USB type B connector for charging and connecting to a PC • Jack connector for external input connection or double photocells.
Distance between antenna and human body	• > 20cm

7.3 WITTY·SEM

Weight	238g, battery included
Dimensions	83 x 103 x 68 mm
Operating temperature	0°C to +45°C
Measurement resolution	4 x 10-5 s (1 / 25000 s)
Display	• High luminosity front matrix 5 x 7 LED RGB, visible area 42 x 60 mm • High luminosity rear lines 2 x 5 LED RGB
Sensors	• Proximity sensor • Ambient light sensor
Radio module	Multi-Frequency Transceiver 433 – 434 MHz
Radio transmission	Digital FSK transmission; redundant code with information correctness verification and auto-correction
Radio frequencies	433.050 MHz to 434.790 MHz
Radio transmission power	10 mW
Impulse transmission accuracy	±0.4 ms
Radio transmission range	Approx. 150 m
Processing unit	16-bit microprocessor
Time base	8 MHz quartz, stability ±10ppm between 0° and +45°C
Power Supply	Internal lithium ion polymer battery, external power supply 5VDC
Battery charging	Integrated intelligent charging device
Battery life	> 10 hours
Connections	• MICRO USB type B connector for charging and connecting to a PC • Jack connector 3.5 mm 3-pole / stereo for photocell, StartPad, button connection etc.
Distance between antenna and human body	• > 20cm

7.4 WITTY·RFID

Weight	169g, battery included
Dimensions	83 x 103 x 68 mm
Operating temperature	0°C to +45°C
Measurement resolution	4 x 10-5 s (1 / 25000 s)
Display	High luminosity rear lines 5 LED RGB
Sensors	• Proximity sensor • Ambient light sensor
RfId module	RFID Transceiver 13.56MHz (ISO 15693)
Radio module	Multi-Frequency Transceiver 433 – 434 MHz
Radio transmission	Digital FSK transmission; redundant code with information correctness verification and auto-correction
Radio frequencies	433.050 MHz to 434.790 MHz
Radio transmission power	10 mW
Impulse transmission accuracy	±0.4 ms
Radio transmission range	Approx. 150 m
Processing unit	16-bit microprocessor
Time base	8 MHz quartz, stability ±10ppm between 0° and +45°C
Power Supply	Internal lithium ion polymer battery, external power supply 5VDC
Battery charging	Integrated intelligent charging device
Battery life	> 10 hours
Connections	• MICRO USB type B connector for charging and connecting to a PC • Jack connector 3.5 mm 3-pole / stereo for photocell, StartPad, button connection etc.
Distance between antenna and human body	• > 5mm

8 DECLARATION OF CONFORMITY

MICROGATE

DICHIARAZIONE DI CONFORMITÀ
DECLARATION OF CONFORMITY

Il fabbricante
The manufacturer

MICROGATE s.r.l.
Via Waltraud Gebert Deeg, 3e – 39100 Bolzano (BZ) - Italy

DICHIARA che il prodotto
DECLARES that the product

Descrizione/Modello *Description/Model*	**WITTY·TIMER – WITTY·GATE – WITTY·SEM – WITTY·RFID**
Destinazione d'uso: *Intended use:*	Sistema di cronometraggio per uso Training composto da Cronometro, Fotocellule, Semaforo Intelligente e sistema RFID di riconoscimento atleti con trasmissione via radio *Timing system for Training purpose, made up of timer, gates (photocells), smart semaphore, RFID athlete recognition system with radio transmission.*

è conforme alle disposizioni legislative che traspongono le seguenti direttive:

- **Direttiva 2004/108 CE (Direttiva EMC) e successivi emendamenti**
- **FCC Rules and Regulations**

is in accordance with the following Directives:

- **2004/108 EC Directive (EMC Directive) and subsequent amendments**
- **FCC Rules and Regulations**

e che sono state applicate tutte le norme e/o specifiche tecniche di seguito indicate
and that all the following standards have been applied

EN 61326-1:2013
Apparecchi elettrici di misura, controllo e laboratorio - Prescrizioni di compatibilità elettromagnetica.
Electrical equipment for measurement, control and laboratory use - EMC requirements

EN 62479:2010
Valutazione della conformità di apparati elettrici ed elettronici di debole potenza alle restrizioni di base relative all'esposizione umana ai campi elettromagnetici (10 MHz - 300 GHz)
Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

ETSI EN 300 220-1 v.2.4.1:2012 + ETSI EN 200 -2 v2.4.1:2012
Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHzfrequency range with power levels ranging up to 500 mW;

ETSI EN 301 489-3 V1.4.1:2002 + ETSI EN 301 489-1 V1.9.2:2011
Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services

FCC Rules & Regulations, Title 47 - Part 15

Direttiva 2014/35/UE *del Parlamento europeo e del Consiglio europeo del 26 febbraio 2014, nota agli addetti ai lavori come Direttiva Bassa Tensione o Direttiva LVD (dall'acronimo inglese Low Voltage Directive)*
Directive (LVD) 2014/35/EU *of the European parliament and of the council dated 26 February 2014 and is applicable from 20 April 2016, on the approximation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits (Low Voltage)*

Bolzano, 11/02/2019
Il rappresentante legale / *The legal representative*
Vinicio Biasi

8.1 FCC CONFORMITY

The Witty·Timer, Witty·Gate, Witty·Sem and Witty·Rfid comply with the following requirements:

- FCC (Federal Communications Commission) Part 15

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC IDs:

Witty·Timer	2ADEOWIT201
Witty·Gate	2ADEOWIT202
Witty·Tab	2ADEOWIT204
Witty·Sem	2ADEOWIT205
Witty·Rfid	2ADEOWIT206

8.2 JAPAN/EU MRA: CERTIFICATION BY TYPE OF THE ORDINANCE CONCERNING TECHNICAL REGULATIONS CONFORMITY OF SPECIFIED RADIO EQUIPMENT (MPT ORDINANCE NO. 37 OF 1981)

Contains MIC ID: 201-160415

This equipment is equipped with specified radio equipment that has received certification of conformity to technical standards, etc., based on the Radio Law.

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The software and manuals are available in the following languages: Italian, English, German, French, Spanish.

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http://www.microgate.it

http://www.microgate.it/Witty