RR400/420 Regularity timer getting started

Tips and tricks

Firmware version **200923** 23/09/2020

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Important: videos explaining the operation of the device can be viewed and downloaded on the page:

http://www.crisartech.com/fr/rr400.html

or ***Youtube channel*** **CRISARTECH**:

https://www.youtube.com/user/CRISARTECH

The latest program and documentation updates can be found on this page:

http://www.crisartech.fr/download/rr400_fr.html

Table of Contents

1 CONNECTIONS 4

1.1 RR400 (WITH SEPARATE INTERFACE) 4
1.2 RR420 (WITH INTEGRATED INTERFACE, BEHIND DISPLAY) 7

2 BASIC PRINCIPLES 9

3 FORWARD / REVERSE, STOP 10

4 MAIN MENU 11

5 VEHICLE TYPE CONFIGURATION, TESTS, CALIBRATION… 12

5.1 VEHICLE TYPE CONFIGURATION 12
5.1.1 Type of connection choice 12
5.1.2 Left or Right wheel choice 13
5.2 SENSORS TEST 13
5.3 CALIBRATION 14
5.4 SIMULTANEOUS CALIBRATION OF THE GPS 15
5.5 CALIBRATION ADJUSTMENT 15
5.6 CALIBRATION HISTORY 16
5.7 WHEEL SENSOR MONITORING 17
5.8 BATTERY VOLTAGE MONITORING 18
5.9 CORRECTING THE BATTERY VOLTAGE 18

6 OPERATING MODES 19

6.1 BEGGINER 19
6.2 CONFIRMED 19
6.3 EXPERT 19
6.4 ORGANIZER 19

7 ENTERING AVERAGE SPEEDS 20

8 USB DRIVE USAGE 21

8.1 8.1 COPY OF RALLY PREPARATION FILES AND RECORDS 21
8.2 MANAGING ARCHIVED FILES 22
8.3 USB DRIVE FORMATING 22

9 INFRARED REMOTE CONTROL 23

9.1 FREEZE / CHANGE DISTANCE – PARTIAL DISTANCES 23
9.2 NEW DISTANCE 25
9.3 MANAGING ZRS WITH THE REMOTE CONTROL 26
9.4 USEFUL THE REMOTE CONTROL SHORTCUTS 26

10 ENTERING A SPEED CHANGE DISTANCE ON THE FLY 27

11 SHIFTED START 28

11.1 FUNCTION ACTIVATION 28
11.2 AVERAGE SPEEDS CHANGES SINCE THE BEGINNING OF THE ROAD BOOK 28
11.3 AVERAGE SPEEDS CHANGES SINCE THE BEGINNING OF THE RT 29

12 MULTISPEEDS MODE 29

13 RECORDINGS 30

13.1 REGULARITY TESTS RECORDING 30
13.2 GPS TRACE DURING SCOUTING 31
13.2.1 Traces with fixed distance 31
13.2.2 Traces with fixed time (0.1 second) 31
13.3 CORRECTION WAYPOINTS DURING SCOUTING 31

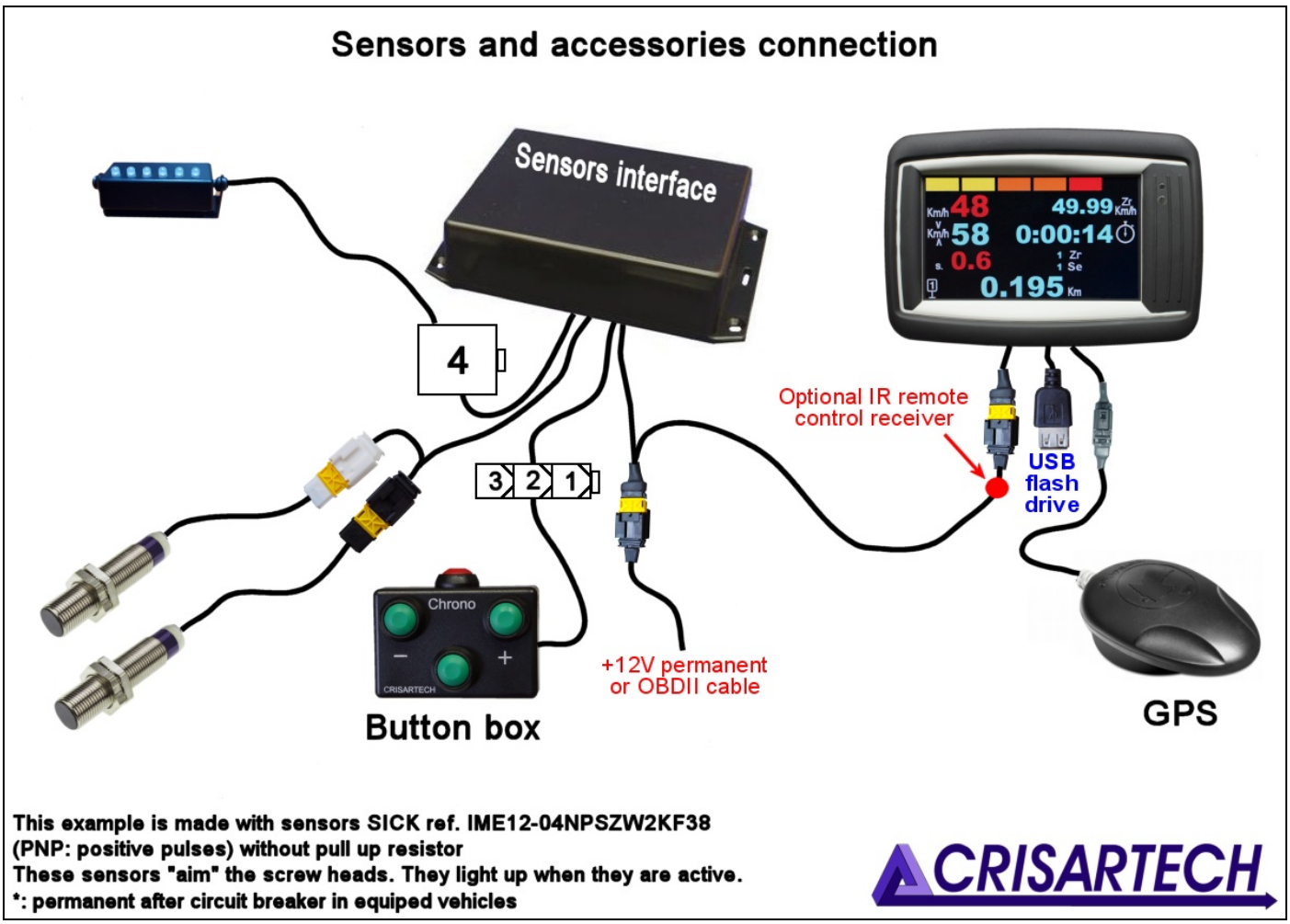
14 "GRAVEL CREW" NOTES ANNOUNCEMENT 32

15 FIRMWARE UPDATES 33

16 WELCOME PICTURE UPDATE 33

1 Connections

1.1 RR400 (with separate interface)



Warning: **the interface provides a power supply for the sensors which is protected by a fuse**. A fuse holder is located on the side of the housing. A 200 mA fuse is supplied as standard (plus a replacement fuse). This value is suitable for most sensors on the market, but **it is up to the installer to check if it is correct for sensors other than those supplied by CRISARTECH**.

The harness for connection to power supply can be replaced by the OBDII harness that plugs into a modern vehicle (after about 2006).

4 ways connector for power supply and CAN bus:

Contact name	Remark	Num.	Colour old car	Colour modern car
+12V permanent power		1/4 M	Brown	Red
Ground		2/4 M	Black	Blue
CAN H on ODBII		3/4 M	/	Yellow
CAN L on ODBII		4/4 M	/	Green

3 ways connecteur - BLACK for RIGHT wheel sensor:

Contact name	Remark	Num.	Colour
+12V power for sensor	on fuse holder	1/3 F	Red
Ground for sensor		2/3 F	Blue
R wheel signal		3/3 F	Green

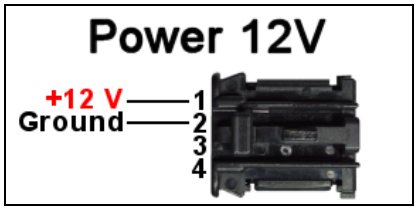
3 ways connecteur - WHITE for LEFT wheel sensor:

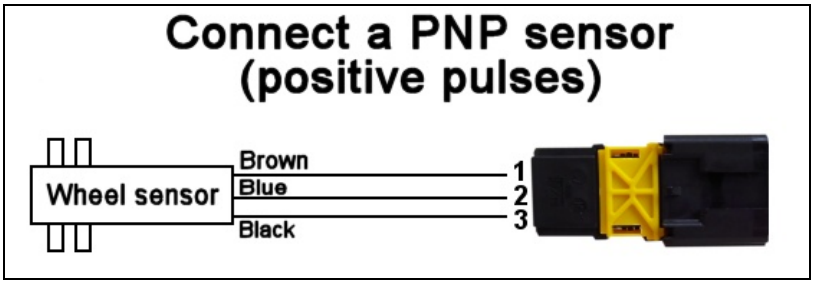
Contact name	Remark	Num.	Colour
+12V power for sensor	on fuse holder	1/3 F	Red
Ground for sensor		2/3 F	Blue
L wheel signal		3/3 F	Green

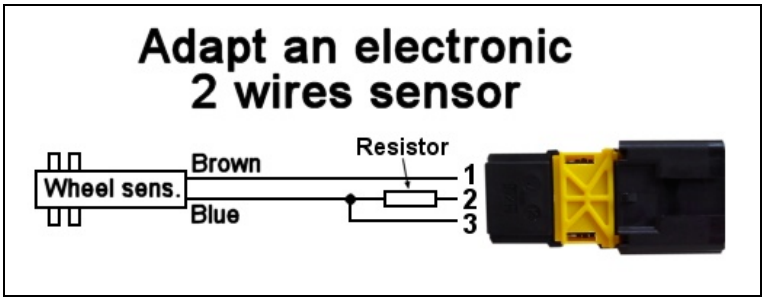
Tip for connectors with crimping pins:

- use crimping pliers for pins rather than welding,
- reinforce the output of the wires with adhesive lined heatshrink Tub (more rigid),
- these "automotive" connectors have a double locking system: when the spindle is fitted, a small click is heard: first locking. Once all the pins are in place, the second system must be locked:
    - yellow plastic part for male connectors,
    - Lid of the same color for females.

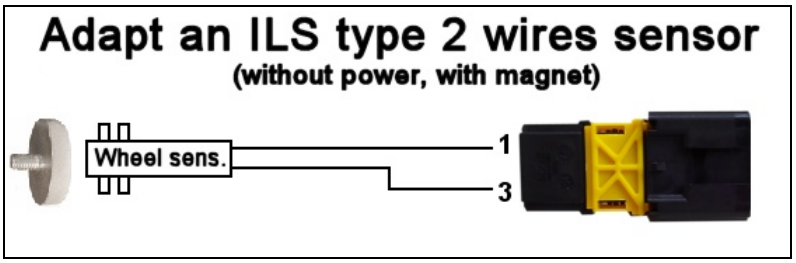
If one of the pins is not in place, it is not possible to close the second lock. If this second locking is not properly installed, the connector can not be connected.

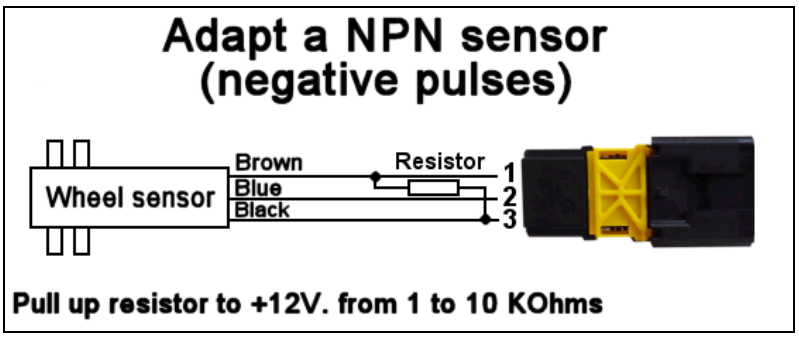




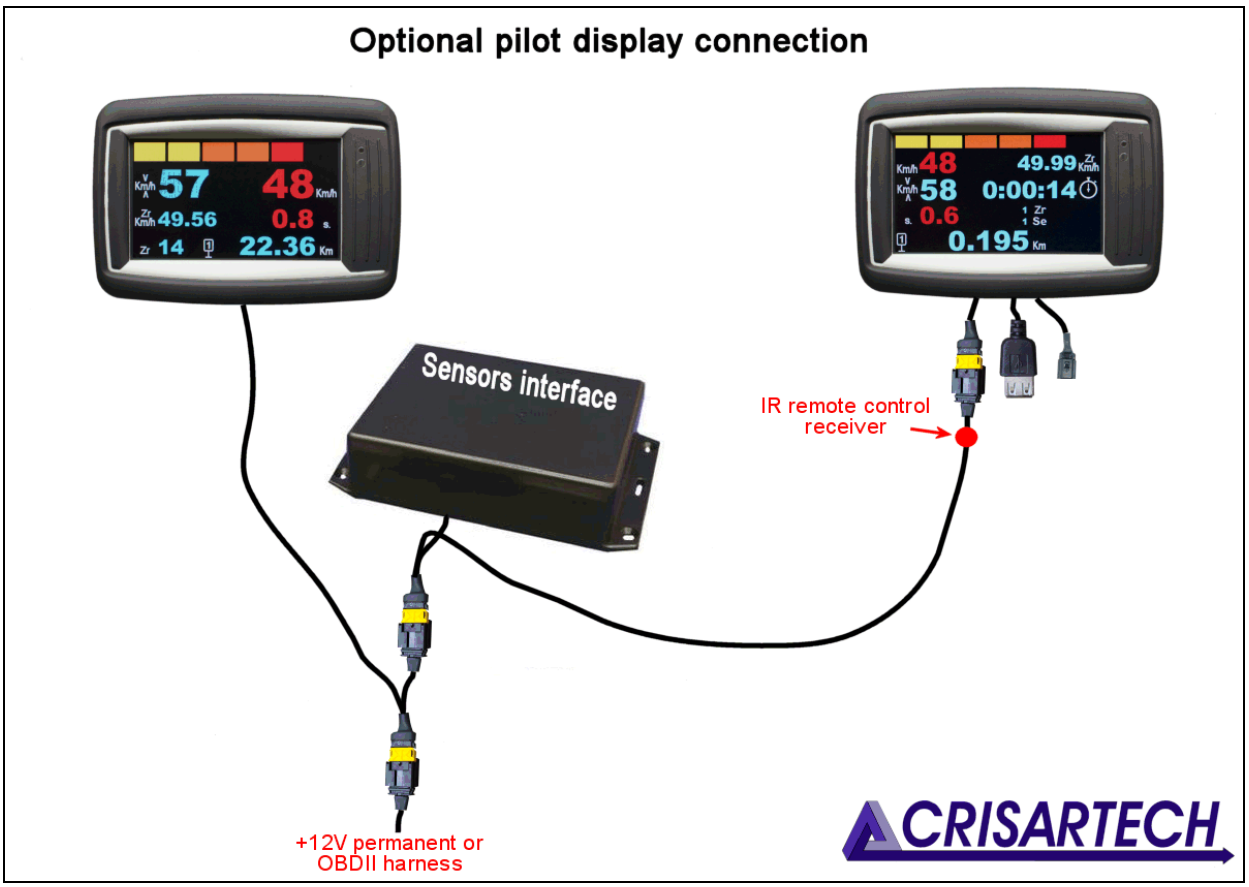


The resistance to put between the blue wire and the mass is 750 Ohms 1/4 watt for the sensors:
- Blunik Carlo Gavazzi inductive,
- Inductive Terratrip T005 ...





The optional "pilot" display connects to the 4-pin connector located to the power supply:



<u>Caution</u>: the infrared receiver for remote control is placed on the harness, just below the display connector. It must be ensured that lens is not masked and turned towards the co-pilot so that the infrared remote control is fully operational.

1.2 RR420 (with integrated interface, behind display)

Important: the plastic case manufactured by 3D printing **does not withstand the temperature that can be found in a closed car, under a windshield, in the summer sun**. Therefore, if your car must stay parked in the sun, we advise you:

- remove the RR420 from the vehicle or place it in a cooler place (trunk ...),
- if this is not possible, turn off the RR420 and use a solar ray reflector (metallized accordion placed under or better on the windshield) and leave the windows open,
- in last resort, turn off the RR420, place a white cloth on the RR420 and leave the windows open,
- **do not leave the cloth on the RR420 during use**.

Connections:

"Universal" 4-wire harness connected to 2-wires sensor (gray connector, 4-pin):

+12V	1	Red	Red	Red	*Usually sensor brown wire*
Ground	2	Blue	Black	Black	*Not connected*
Signal	3	Green	Orange	Orange	*Not connected*
Ground -Signal	4	Yellow	Yellow	Brown	*Usually sensor blue wire*

"Universal" 4-wire harness connected to 3-wires sensor (gray connector, 4-pin):

+12V	1	Red	Red	Red	*Usually sensor brown wire*
Ground	2	Blue	Black	Black	*Usually sensor blue wire*
Signal	3	Green	Orange	Orange	*Usually sensor black wire*
Ground -Signal	4	Yellow	Yellow	Brown	*Not connected*

Harness for 3-wires sensor (gray connector, 4 points):

+12V	1	Red	*Usually sensor brown wire*
Ground	2	Blue	*Usually sensor blue wire*
Signal	3	Green	*Usually sensor black wire*

Beam for 2-wires sensor (gray connector, 4 points):

+12V	1	Brown	*Usually sensor brown wire*
Ground -Signal	4	Black	*Usually sensor blue wire*

Power harness (black / blue connector, 4 points):

+12V	1	Red	Brown	Red
Ground	2	Black	Black	Blue

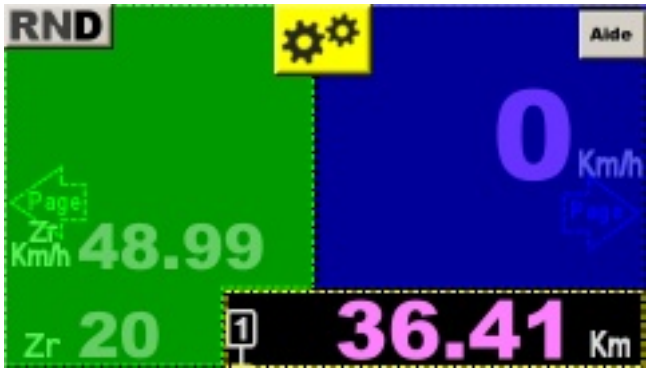
Note: The RR420 provides a power supply for sensors that is protected by an automatically resettable fuse. There is nothing to do in case of a short circuit.

2 Basic principles

This timer uses a touch screen for the configuration, calibration, speed input ...

To modify an item, press the item zone. In "beginner" mode, the user is guided by a grid that indicates the different sensitive zones:
- "chrono"
- "trip"
- 'ZR'
- "correction cancellation"...

The page change is made by pressing outside these areas, next page on the right and previous on the left, in blue and green respectively on the following images:



Pilot page

Copilot page (main page)

Link page

Trips page

 buttons allow you to go back, exit the configuration pages...

<u>Warning</u>: if a parameter has been modified, the modification is saved!

Data fields with a blue-white-blue gradient background are input fields with the touch keyboard:

Do not forget to use the **help buttons** when in doubt (except expert mode), or “guide” key on the remote control:

3 Forward / Reverse, Stop

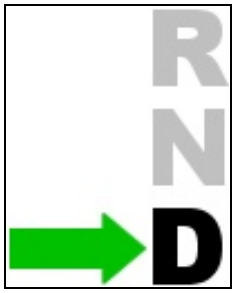
To access the RND panel (analogy to the automatic gearboxes):

- press the screen (top-middle of preference) then on the button 

that appears in the top left,
- press the 

key on remote control Philips or 

key on the “one for all”



- **R** for "Reverse"
- **N** for "Neutral" or stop counting,
- **D** for "Drive" or Forward.

Then press the desired operating mode or use remote control: 

or 

This panel will only be displayed when the position is different from "Drive".

Special case in GPS measurement:
Tunneling is a serious problem because the signal is gradually lost and the speed transmitted by the GPS becomes erroneous before the signal is lost. To avoid this, it is possible to block the speed before entering the tunnel. By driving at constant speed, it is possible to cross the tunnel without too much distance error. The manipulations to do are the following:

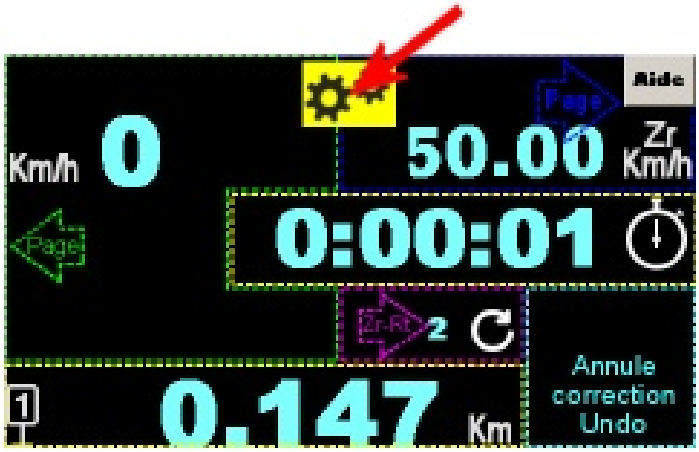
- display the above sign before arriving in the tunnel,
- press D to block the speed and display the following panel:

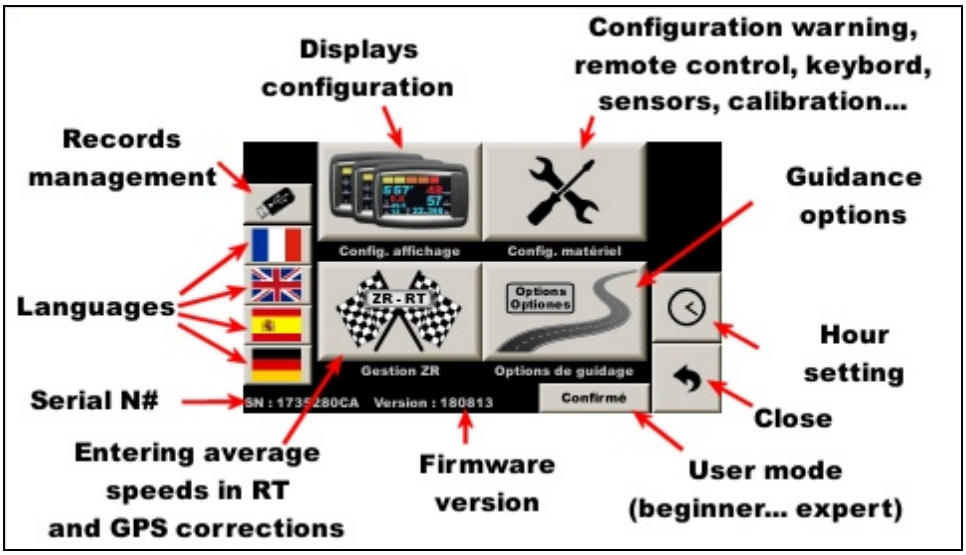
- cross the tunnel at the most stable speed possible,
- when leaving, press again on this panel to resume the GPS speed.

Note: with remote control: press  or  to lock / unlock GPS speed.

4 Main menu

To access the main menu, press the screen (top, middle preferably) and then the yellow button that appears:





5 Vehicle type configuration, tests, calibration…

In the main menu, press the button with tools:

5.1 Vehicle type configuration

In the following menu, press the button with auto and ruler:

5.1.1 Type of connection choice

Start by choosing the type of connection:

- **GPS** (not very accurate),
- **OBDII** (diagnostic socket), then the vehicle type. Those marked "**ABS**" have a very precise measurement of the distance (from 1 to 10 cm). "**Obd 11 bits**" and "**Obd 29 bits**" are *universal* but not very accurate (1 to 3 m error per km). This precision is sufficient in the race because it is negligible in relation to the trajectories cut but insufficient for the measurements carried out for creating road-books or scouting,
- **wheel speed sensor** (s). Three configurations (A, B, and C) are proposed, corresponding to **3 different types of tires**. This makes possible to memorize in the device 3 calibration values that will be associated with each type of tire. By changing the wheel during the race, simply change the configuration here, without having to change the value by itself,
- **speed simulation** (speed is set with two buttons).

These points can be "swept" using the **up** and **down** arrow keys on the remote control. In **OBDII** configuration, the **red** and **blue** function keys are used to select the type of vehicle.

5.1.2 Left or Right wheel choice

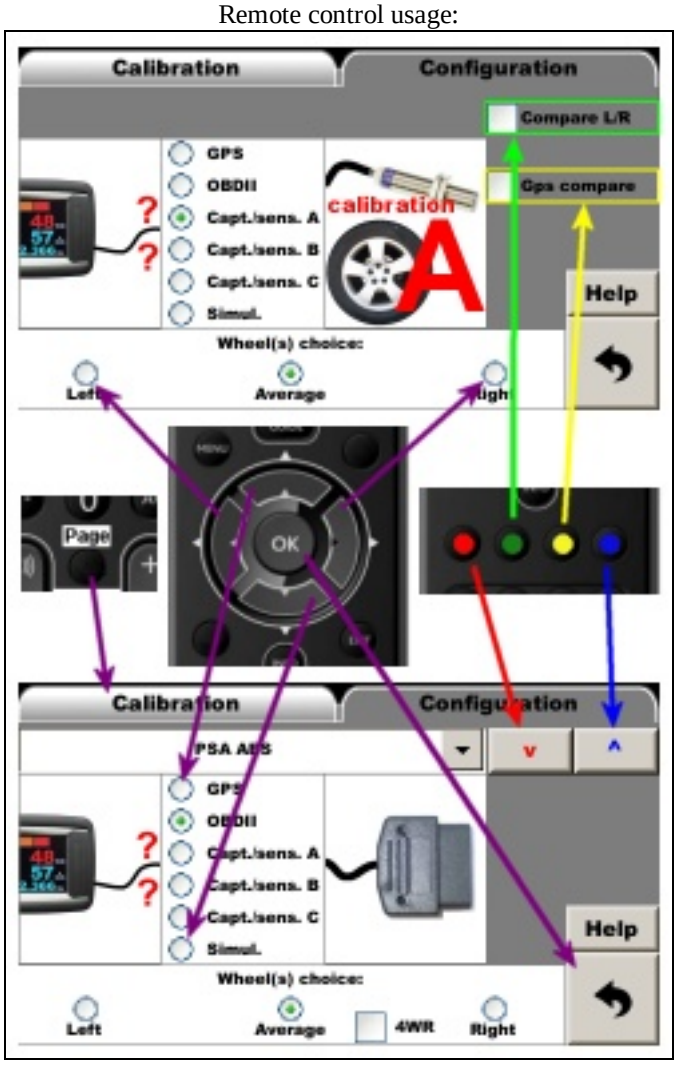
When possible, a panel at the bottom of the screen can then choose whether the distance should be **measured on the right / left / average** of the two wheels.

These choices can be "swept" using the **left** and **right** arrow keys on the remote control.

Note:
- with *"Peugeot/Citroën ABS"* OBDII configuration **4WR** check box add 2 more wheel inputs (front wheels),
- with the **Capteur/sensor** configuration, two checkbox add the sensor monitoring function based on the GPS **(Compare GPS)**, or on left/right wheel sensor comparison **(Compare L/R)** , see below.

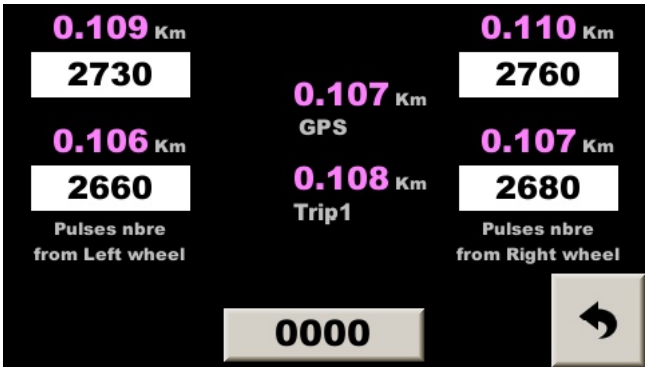
- Then go to the "**Calibration**" tab (**Page** key on remote control).

Remote control usage:



5.2 Sensors test

If the system allows it (wheel speed sensor or OBDII in ABS mode), the **Detailled distances** button displays the pulses sent by the sensors via the page (the number of counters can be different according to the configuration):



This page help to compare all the wheel "sensors", the distance calculated for each wheel, the GPS distance calculated and Trip1, based on the configuration and the above distances

In case the timer is connected to wheel speed sensor (s), first check that each pulse increments the counter of the rotating wheel.
At the end of the installation, before calibration, carry out **a test by accelerating progressively up to the maximum speed** of the vehicle. The displayed speed must be stable (even if it is false because not yet calibrated).

If this is not the case, the speed sensor(s) are incorrectly adjusted:
- if the speed tends to fall to 0 beyond a certain speed, the sensor misses tops at high speed, it must be too far from the "target" or "target" is not of good "ferromagnetic quality",
- if the speed tends to double at certain times, the sensor records "rebounds". This can happen with ILS sensors when they are too close to a very powerful magnet. Or problems of false contacts

5.3 Calibration

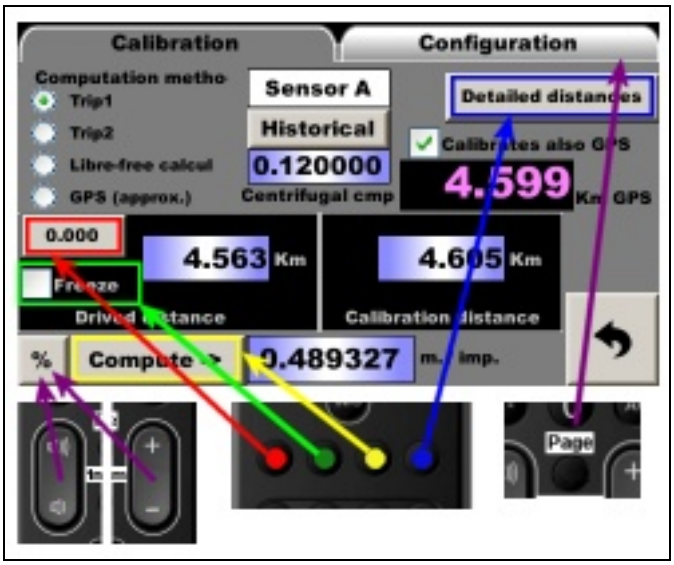
Once measurement configuration has been chosen (GPS, OBDII, or sensor), it is necessary to calibrate for your device measures the distances precisely, but especially in the same way as that of the organizer. The RR400 uses a very precise calibration coefficient. Or rather several coefficients:
- calibration coefficient when the measurement is made by GPS (the value is about 1),
- calibration coefficient when the measurement is made by the OBDII socket (the value is about 1),
- 3 calibration coefficients when the measurement is made by the wheel speed sensor (the value corresponds to the distance of a sensor top, ie the perimeter of the wheel divided by the number of tops per revolution), one coefficient for each tyre type (A, B or C),
- calibration coefficient when the speed is simulated (the value is about 1).

But this coefficient is then used to measure ALL distances (Trip1 to Trip3, and Totalizer)

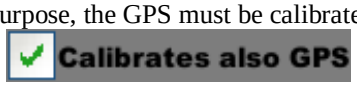
On the calibration page, select the calibration **mode**:
- **Trip1** uses the first counter to perform the calibration. This is the default mode, the simplest,
- **Trip2** uses the second counter to perform the calibration. Used to calibrate (or refine calibration) during the first ZR. In this case the Trip1 was used and adjusted during the ZR, so not usable to calibrate. Trip2, on the other hand, has not been modified and can be used to calibrate at the end of ZR, using the theoretical distance written on the road-book. The advantage is to have a distance generally longer than the calibration zone and taking into account the cut curves (driving style),
- **Free calcul**: here only the function of "special calculator with rule of proportionality " is used: calculation of the calibration from a distance that has been measured before and the corresponding theoretical distance,
- **GPS**: to perform a **rapid calibration** of the speed sensors, we use the GPS speed. This method does not have the precision required to perform a rally, but allows a quick calibration after the sensor test. This allows you to have a correct speed displayed in the main page without needing to go on a calibration zone, but **does not replace in any case a real calibration at the beginning of the rally**.

Typical case of Trip1:
- drive to the the beginning of the calibration zone,
- press button "0.000"
- drive to the end of calibration zone, the distance is displayed in the left field,
- enter the zone theoretical distance in the right field,
- then press the "**Compute**" button: the new value is displayed next to it.

Congratulations, it's over!



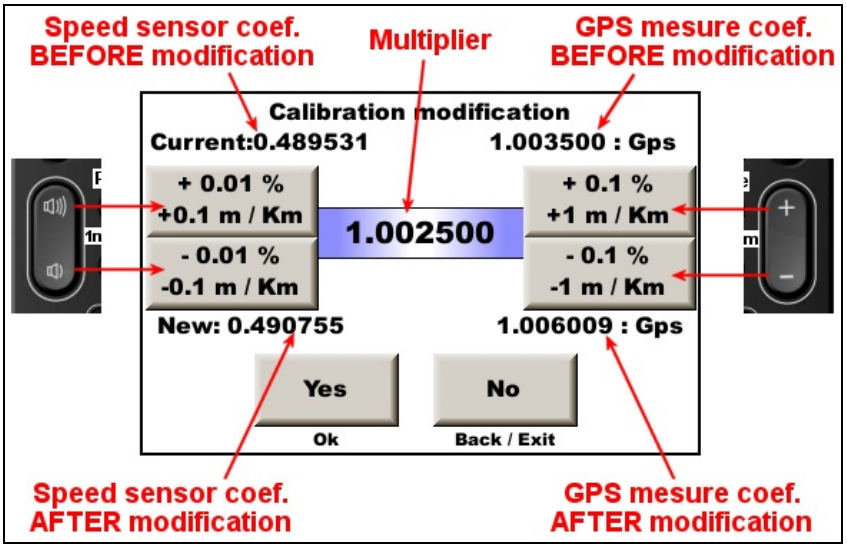
5.4 Simultaneous calibration of the GPS

When one or more speed sensors are used to measure the distance, the GPS can be used as a backup measurement means in case of failure of the sensor (s). For this purpose, the GPS must be calibrated in the same way as the speed sensors. On the calibration area, just check the box: 

By calculating the calibration coefficient of the speed sensors, the RR400 calculates the calibration coefficient of the GPS and displays it in an information panel. It must be close to 1.

5.5 Calibration adjustment

If the co-pilot realizes that his calibration is not optimal, he can easily adjust it, while driving, in **percentage** (except beginner mode). In the calibration screen, the button opens a window allowing this adjustment:



For memory, each button displays the % and the number of meter per Km of the adjustment.

5.6 Calibration history

The button 

is used to display a table of the different calibration values calculated on the device:

Date – hour	Source	Method	Calibration
2018/09/01-07:24	OBD	MAN	1.025399
2018/09/01-07:28	GPS	MAN	0.9869231
2018/09/01-07:31	Sensor A	MAN	0.4893265
2018/09/05-16:08	Sensor A	%	0.4895712
2018/09/05-16:08	Sensor A	MAN	0.4895712
2018/09/05-16:08	Sensor A	TRIP1	0.4886692
2018/09/05-16:08	Sensor A	MAN	0.4886692
2018/09/05-16:08	Sensor A	TRIP2	0.4893671
2018/09/05-16:09	Sensor A	MAN	0.4893671
2018/09/05-16:09	Sensor A	FREE	0.4898044
2018/09/05-16:10	Sensor A	GPS	0.4895166

The **Source** column corresponds to the input selected to calculate distances that has been calibrated (**GPS**, **OBDII**, **Sensor A, B, C** or simulation).
The **Method** column recalls which method was used to change the calibration:
- **MAN**: the calibration value was entered directly with the keyboard,
- **TRIP1** or **TRIP2**: the value has been calculated on a calibration zone,
- **FREE**: the value has been freely calculated based on a distance traveled and a reference distance,
- **GPS**: the value was calculated approximately using GPS speed,
- **%**: the value has been adjusted by percentage.

Note: during TRIP1, 2 or FREE calculations, the value before calculation is recalled on the top line in **MAN**.

The file containing these data is copied to the USB drive at the same time as the race recordings and can be archived with this data.

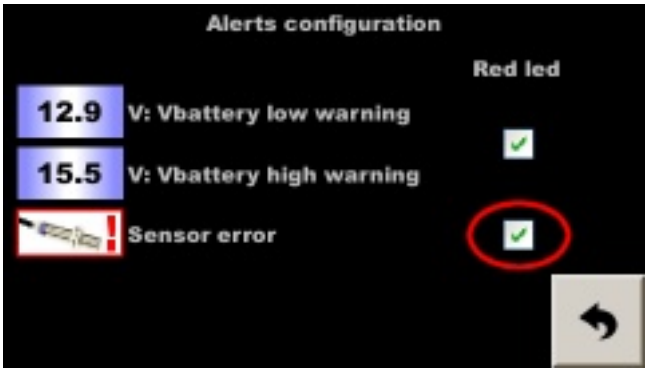
The button  deletes the table.

Button  allows you to resume a calibration in the table. Start by selecting a line, then press this button.

5.7 Wheel sensor monitoring

Specifically for the **Capteur/sensor** configuration it is possible to activate the sensor signal monitoring function by ticking the **Compare GPS** or **Compare L/R** box in the configuration tab of the input used for speed measurement. The distances measured by the sensors left and right and/or the GPS are compared and if a significant difference appears, an alert popup is displayed in the main running screens:

The red LED flashes if the corresponding box is checked in the alert configuration screen:



Menu - Config. equipment - Alerts config.

By removing this popup, we can display the percentages of error, which allows to better understand the problem:

- if a slight difference appears between right and left, following a succession of turns in the same direction, we can consider that it is a false alarm, but it is necessary to monitor the / the sensors,
- **if a slight difference appears after changing tires, you must change the calibration,**
- if a difference with GPS appears after having crossed a tunnel, an avalanche barrier, or a very dense forest, it is normal the GPS lost some meters,
- **if a significant difference suddenly appears, a sensor may be faulty, especially not perform "on-the-fly" correction (+/- 1 or 10 m key) before confirming or reversing this assumption.** To do this, go to the detailed distances page to monitor the distances of each sensor. If the failure of one sensor is confirmed, use the other or the GPS. The most correct distance will be restored automatically when the faulty sensor is ignored, because the distances (L wheel, R wheel and GPS) are measured separately, then selected or averaged to serve Trip1. But during a correction, the three are synchronized, that's why we must not correct "on the fly" when we have a doubt.

	action on the touch screen:	action on the remote control:	the test resumes after:
hide popup and display the percentages of error	maintained push (2 seconds)	**INFO** key	30 seconds
simply hide popup	simple push	other key	2 minutes

There are three parameters to fill in:

- measurement distance before comparison (in km), common for both tests,
- maximum error for left / right wheel comparison (in%),
- maximum error for GPS and wheel comparison (in%).

This function can be used in two ways:

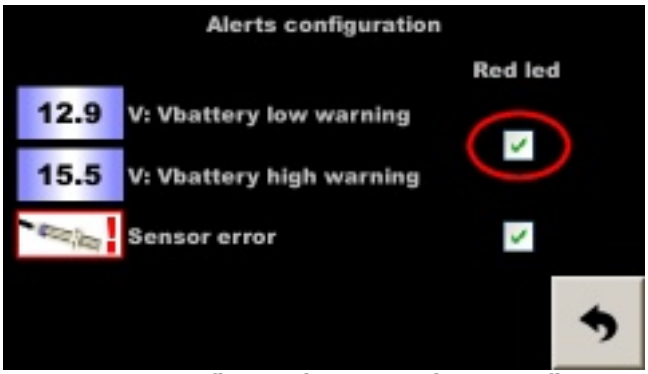
- monitoring "health" sensors: put a distance short enough to quickly detect a failure (0.15 km for example) and a maximum error large enough to avoid false alarms (5% for example),
- calibration error detection (forget calibration change after changing wheels for example): put a distance long enough to avoid false alarms (0.8 km for example) and a maximum error strict enough to detect small errors (1 % for example).

The given values are indicative and are to be refined before the rally according to the configuration (number of pulses per revolution for example).

5.8 Battery voltage monitoring

The battery voltage is displayed in the link screen.

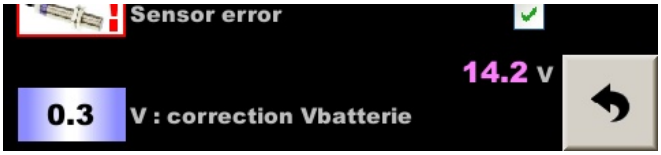
In case of low or high battery level, a warning popup is displayed in the main running screens. The ignition thresholds can be changed in the alerts configuration page and the red led can follow the display of the popup:



Menu - Config. equipment - Alerts config.

5.9 Correcting the battery voltage

In Expert mode, it is possible to adjust the battery voltage for display as well as for monitoring. At the bottom of the alerts configuration page:



In some cars, there may be a few tenths of a volts difference between the displayed voltage and the actual voltage. This parameter allows them to be compensated. The value read is displayed on the right and should be compared with a voltmeter connected to the battery.

Note: the use of a back-up battery requires systematically adding 0.6 Volt

6 Operating modes

This system has 3 operating modes, to be chosen at the bottom of the main menu, depending on the co-pilot's experience.

6.1 Begginer

This mode displays a help grid to know the different sensitive areas.
It hides certain complicated parameters:

- clock shift,
- setting the number of km / h by buzzer beep,
- conditions of lighting of the bargraph,
- number of meters added / removed with each press on button box ...

Attention: the **automatic start of the chrono can only be done on each full minute**.

6.2 Confirmed

Mode to be used as soon as the user feels comfortable with the machine to take full advantage of it.

6.3 Expert

This mode deletes the help buttons and adds a history of distance modifications, manual or automatic (GPS).

6.4 Organizer

This mode replaces the waypoints entered in automatic GPS corrections by the points useful to edit a road book as well as timing. A separate manual explains these functions.

7 Entering average speeds

The average speed entry form is accessible:
- from the main menu: big button with flags,
- from the co-pilot page (main page): press the area of the screen where the ZR number is displayed:

- from the co-pilot page (main page): press the yellow button on the remote control.

For each speed segment (**Se**, left column), enter the end distance and the average speed. The corresponding timing is displayed progressively in the right column, which allows to control the accuracy with some road-books that give these indicative values.

The segment start distance does not have to be entered, it corresponds to 0 for the first segment, and at the end of the previous segment for the others.

At the end of the entry, the data must be saved in a file by pressing the floppy disk button.

If the data is modified during the ZR, they are taken into account immediately but it is necessary to save before leaving. In case of forgetfulness a popup asks if one wishes to save.

To change the ZR, you can press on the top left the + and - buttons or the ZR number.

Note: to quickly enter a large number of distances / speed it is easier:
- to put the timer on the knees, like a tablet, and use pencil with eraser or a plastic pen (not ball side!) as a stylus. Ladies with long nails can also use a nail,
- or use the infrared remote control, see later § the use of this accessory.

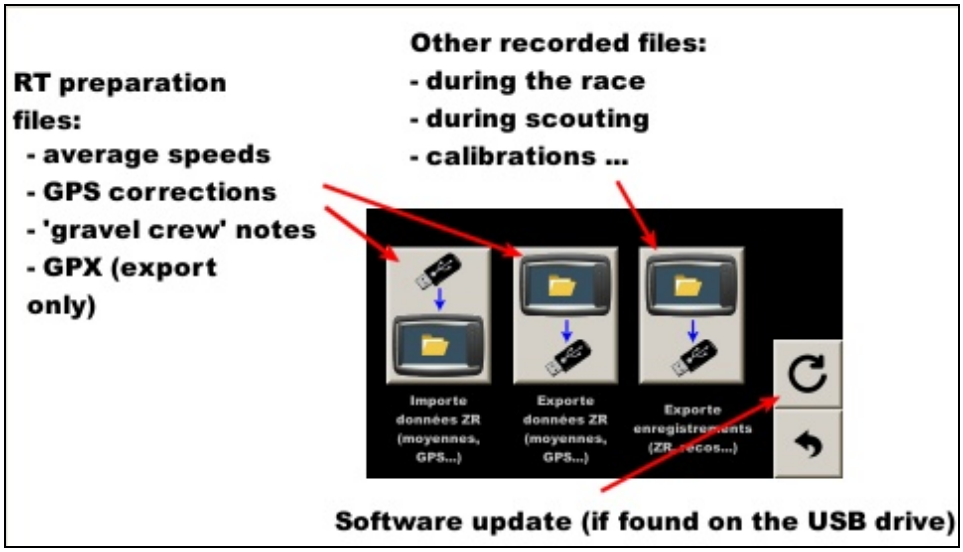
8 USB drive usage

Important:
- the file system read by the device is FAT32. This is the most common and most commercial USB drives use this file system,
- all the USB3 dirves are not compatibles.

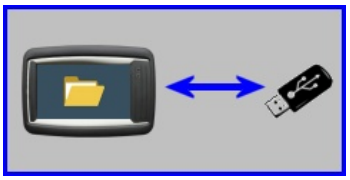
If in doubt about the file system of your USB drive, it is possible to format it on the device before using it.

8.1 8.1 Copy of rally preparation files and records

Once a USB key is inserted into the USB socket, a specific page opens:



A popup panel is displayed during the copy:



After closing this panel, please wait to remove it until the "operation" led of the USB key is off or about 5 seconds if the USB key has no led.

After the recorded files copy (right button), **the files are compressed, archived to internal drive** in case of problem with USB drive. The format of archive file is .tar.gz (linux format, can be unpacked with IZArc, 7-Zip, WinZip…).
Then the original files are erased from internal disk.

8.2 Managing archived files

In case of loss of the race files, it is possible to recover the archived files. In the main configuration page, press the button with the USB key:

Insert a USB drive in the socket then push on the left button to access a page to:
- copy the archive files if needed (if files on USB drive have been lost),
- delete the archive files.

After each race, the archive space should be cleared to free internal flash disk!

8.3 USB drive formating

This function will erasesALL data and then formats and conforms it for use with this device.

To access this function, in the main configuration page, press the button with the USB drive:

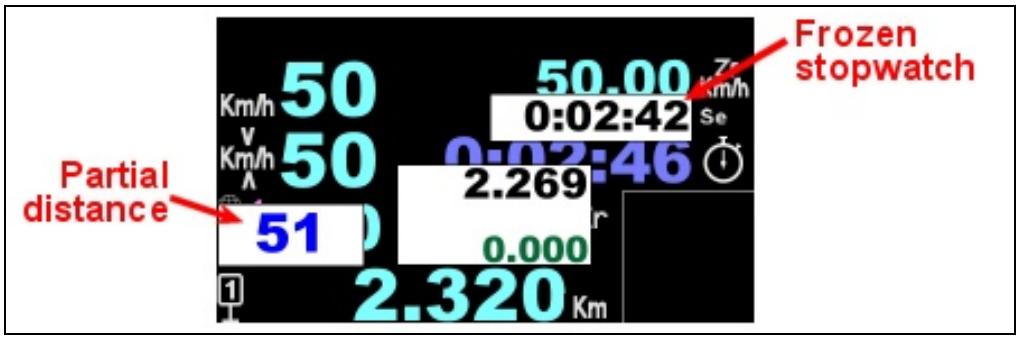
Attention:
- this operation erases ALL the data present on the key, even if they were written with a computer or a tablet,
- it is advisable to wait ten seconds after the end of the operation, when the display asks to remove the key.

9 Infrared remote control

The decimal point is obtained with the key at the bottom right for Philips (formerly "reset to 0" or "---") or left for OneForAll:

As soon as the remote control is used, frames in red, green, yellow, blue appear in certain areas or buttons. These zones are activated by pressing the corresponding function keys on the remote control:

9.1 Freeze / change distance – partial distances



To freeze the distance, use the **OK** key on the IR remote control or the central button of the button box or the pedal.

If the stopwatch is running, a popup with the **frozen stopwatch value** is displayed above the stopwatch. This allows you to check any timing shown on the road book.

The **partial distance** from the frozen point is displayed on the left. This distance is **reset to 0 each time you press the same button** again.

To delete these popups, press the **BACK** or **EXIT** key on the remote control or press one of the popups on the touch screen.

The frozen value can be changed with the number keys or with +/- 1 or +/- 10 m. on the IR remote control or the +/- buttons of the button box. The new value appears in blue and the difference in green. When validating with the **OK** key, the difference is applied, that is to say that the trip takes into account the distance that runs during the time of manipulation:

Example:
- freeze distance to 14,226 km. in front of a sign,
- on the road-book is written 14,235 km for this panel. We type this value,
- valid further at km 14.600, the trip goes to 14.609 km applying the difference,
- the difference (+ 9 m.) is displayed in the history at the bottom right of the screen.

Notes:
- the difference display (in green) may be hidden in the co-pilot page configuration.
- the frozen stopwatch value may be hidden in the co-pilot page configuration.
- the frozen value is displayed in meters as part of the command history, bottom right, and during the race, it is saved in the trace file (preceded by the letter F), if this action is not canceled with **BACK** or **EXIT** key.

9.2 New distance

To force a new distance, use the numeric keypad and then valid with the **OK** key.

If the distance entered is greater than the current distance (the classic case of distance correction) a "countdown" indication is displayed on the left: negative distance. This declining indication allows you to better locate the visual cue to make the correction (not to make a mistake on the telephone pole for example) or the crossroads to change direction. The co-pilot can announce the declining distance without having to calculate and make a mistake:

Example:
- on the road-book is written 14,235 km for a sign. We type this value before reaching the sign,
- valid in front of the panel, the trip passes to 14.235 km applying the new value,
- if the distance was 14,226 km, then the difference (+ 9 m.) is displayed in the history at the bottom right of the screen.

If the distance entered is greater than the current distance or if we “miss” the marker or the crossroads, the indication becomes positive and grows as we move away:

Note: this distance popup is displayed from 1 km before to 1 km after the distance entered, and disappears when you confirm the distance to set Trip1 new value.

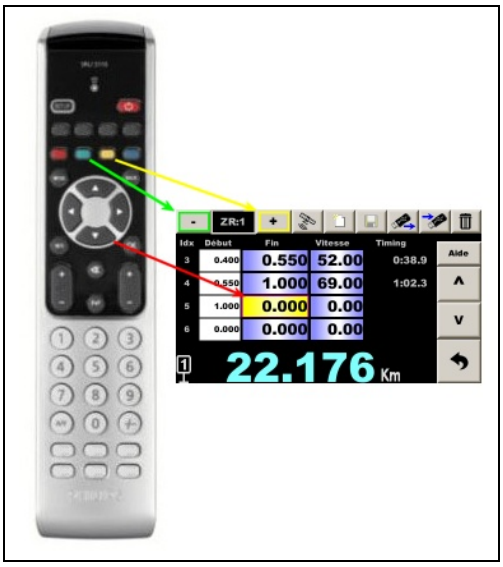
this manual correction technique is highly advised to use

It has the following advantages:
- we prepare the distance if we have the time without feeling constrained by the difference found with the previous technique. Indeed, if we freeze at the entrance of the village for example, we can miss a change of direction in the village because we are monopolized by the correction,
- if we did not have time to prepare the distance, we can fall back on the previous technique,
- if we made a typing error, we can detect it before validating, and if we do not detect it, the resulting correction (displayed in the history at the bottom right of the screen) will be important. It will then be possible to cancel this correction by pressing the history or with the. **BACK** or **EXIT** key.

To delete these popups, if you have missed the visual marker, for example, you must press the **BACK** or **EXIT** button on the remote control or press one of the popups on the touch screen.

9.3 Managing ZRs with the remote control

To change the ZR, use the green and yellow keys.
To program the distances / speeds in ZR, use the arrow pad to move the active box, then simply type the distance or speed and validate with "**OK**" key:



Save with the red key.

9.4 Useful the remote control shortcuts

Page	Key	Function
Copilote (main)	Yellow	Go to RT management page
Copilote	Green	Go to speed configuration page (sensor/OBD…)
Copilote	Page	If stopwatch is active, go to 'pilot' page if not authorized following page
Copilote	BACK or EXIT	Last correction cancelation
RT management	Green	Previous RT
RT management	Yellow	Following RT
RT management	Red	Record
RT management	Short Page	Go to GPS auto correction page
RT management	Long Page	Go to gravel crew notes page
Speed configuration	Page	Go to calibration page
Speed configuration	OK	Record and direct back to copilot page (main)
Calibration	Page	Go to speed configuration page (sensor/OBD…)
Calibration	OK	Record and direct back to copilot page (main)

Examples to do quickly while driving:

- a wheel sensor breaks -> go from average measurement to left wheel measurement only:
  `green, right arrow, OK`
- the last wheel sensor breaks -> go from wheel sensor measurement to GPS measurement:
  `green, up arrow, up arrow, OK`
- the calibration is too short, add 3 m / Km:
  `Green, page, +10 m, +10 m, +10 m, +10 m, OK, OK`
  (It is necessary 4 push on +10 m because the first one opens the correction by% function)

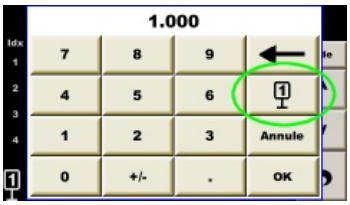
10 Entering a speed change distance on the fly

In the case that a shift distance is not given before departure, but "at the sign", proceed as follows:
- by preparing the ZR, put a longer distance,
- start the ZR normally,
- before arriving at the sign, open the page with the distances / speeds table,
- with the IR remote control: place on the corresponding box at the end of the segment (a blue frame appears on the pictogram of Trip1 in the bottom left), then press the blue key passing in front of the sign:

The timer saves the new distance and updates the lead / delay.
Maybe change the speed if it was written on the panel, **but be careful, the new speed is on the next line!**
Save this speed change (red key on the remote control): the timer recalculates the timing and updates lead / delay with new speed, then return to the main screen.

Tip: you can access this page directly from the main page by the yellow key on the remote control.

- with the touch screen: tap on the box corresponding to the end of the segment, the virtual keyboard opens with a special key with the pictogram of Trip1, then press this key passing in front of the panel:



If necessary, modify the speed if it was written on the panel, **but be careful, the new speed is on the next line!**
Save the modification (floppy button): the timer recalculates the timing and updates the lead / delay. Then return to the main screen.

11 Shifted start

In some rallies, the Regularity Tests are "included" in the links, ie the distance is not reset to 0 from the RT start.

You can also use this function when you are doing reconnaissance (with automatic GPS or manual corrections) and you do not know the exact starting point of the RTs. We will then start the reconnaissance before the earliest estimated starting point to be sure, the race day, to start the correction notes BEFORE the start of the RT.

Example: a RT is organized between village A and village B, but we don't know where exactly:
- we start our reconnaissance by resetting Trip1 in front of the church in village A or better, on a road book note,
- we take our road to village B by taking our correction points (by GPS preferably),
- arrived at village B, preferably on a road book note, we stop the correction points,
- the race day, we reset our Trip1 to 0 at the point of reconnaissance. If we use GPS correction , we arm the chrono (press once on the chrono or the chrono button to popup the chrono panel),
- in case of automatic GPS correction, corrections begin while we drive towards the secret departure of the ZR,
- **at the start of RT, do not reset Trip1 to 0**,
- we begin the RT by starting the stopwatch as usual except that Trip1 is not reset at 0,
- the timer does its job taking into account the distance which was at Trip1 at the start of the RT…

In this case the changes of average speeds are made according to the beginning of the RT, see §11.3

11.1 Function activation

To do this, check the box "**Shifted start**" in "**Guidance options**". By doing this, the Trip1 is not set to 0 automatically when the timer starts and the timer takes into account the distance to the counter at the start for his calculation for lead / delay.

11.2 Average speeds changes since the beginning of the road book

Generally, the distances of the average changes are given starting from beginning TC of the section of the road-book, and not from the beginning of the RT as usual.
It is then necessary to check the box "**Km from start RB**" located under the table of distances / averages.

We must fill the distance boxes with the km that do not start at 0, even if the distance indicated in the first box (not modifiable) is 0. This is not a problem, because what matters is the km end of the first segment, the one that gives the first change of average.

Example:
- departure from the RT to 28.5 km at 49.00 km / h
- change of average to 30.0 km (after 1.5 km) at 50 km / h
- change of average to 32.0 km (ie after 2 km) at 45 km / h
- end at 35.0 (after 3 km) km

Note: timings must not be taken into account.

11.3 Average speeds changes since the beginning of the RT

In some rallies, even if the Trip1 is not reset to 0, the average changes distances can be given from the beginning of the RT, when the timer is started. This is the case if the starting point is secret (not indicated in the road book).

Example: distances / speeds idem previously:

12 MultiSpeeds mode

In this case the co-driver must enter distances and times of passage (instead of average speeds). The table can be given by the organizer in advance or just before the start of the regularity test.
In the classic mode, end of segment timings are given as an indication. In the multi-speeds mode, you can enter them, **but only on the remote control** in this version.

Check the box at the top right:

After entering the distance, the cursor automatically switches to the time entry box. You have to enter:

mm:ss.t

- mm: minutes beginning with 0 if less than 10 mn
- ss: seconds
- t: tenth of a second that can be omitted if 0

A timing is proposed, based on the timing of the previous line. To accept it, just confirm with **OK**. It is possible to adjust this timing with the **+/- 10 m** key (one second) and **+/- 1 m** key (0.1 second).
Once the timing is entered, the timer takes into account the segment, it calculates the average speed and refreshes the lead / delay, it is not necessary to record with the red key.

The following distance is proposed, **by systematically adding the distance of the first line**. It is therefore important to choose the first distance wisely (to be entered before the start), because it will give "the tempo" for the whole ZR. It is possible to change this proposed distance:
- by entering a new distance,
- by adding / subtracting 100 m using the **+/- 10 m** or **+/- 1 m** keys.

Once modified or if the proposed distance is correct, it simply remains to validate it with **OK**.

It is possible to enter the average speed as the conventional mode if the table mixes speeds and times of passage.

Warning:
- **it is necessary to start the timer with at least one speed line, otherwise the timer does not know how to start,**
- **when leaving this page it is necessary to save in the file with the red key, otherwise the timer will resume the file data before these changes.**

13 Recordings

This equipment records files during the race.
It can also record several files during scouting:
- GPS trace in two formats,
- correction waypoints for GPS auto-correction.

13.1 Regularity Tests recording

As soon as the stopwatch is triggered, a file is recorded into the internal flash disk. Its name is the start number, the RT number, date and hour. The format is the following:

S	10				
V	4500				
P	14:26.0	0	44.7522823	4.2335585	0
…					
P	14:39.7	17962	44.7514067	4.23258083	-74
G	4				
M	42587				
D	5				
A	-10				
C	10				
F	42697				

First column is a label indicating the type of data:
- S: Start of RT, then the index of the RT. Here ZR10,
- V: speed imposed in 1/100 km/h. Each speed imposed changement is recorded. Here 45.00 km/h,
- F: the co-driver froze at this distance, in meters,
- D: GPS advise, in meters. Here the GPS advises to add 5 meters to Trip1,
- G: GPS auto-correction, in meter. Here GPS added 4 meters to Trip1,
- W: GPS auto-correction waypoint missed, then the index of the waypoint,
- M: manual set, in meter. Here the copilote set Trip1 to 42.587 km,
- A: manual (relative) adjustment. Here the copilote substracted 10 meters to Trip1,
- C: operation Cancel in meter. Here the copilote cancel the '-10 m' so he added 10 meters,
- P: gps Position and more:
  - time-stamp: Minute:Second.Tenth, here 14 minute and 39.7 seconds
  - distance in meter, here 17.962 km,
  - latitude in degrees, here 44.7514067° North (44°45'05.1"N),
  - longitude in degrees, here 4.23258083 East (4°13'57.3"E),
  - delay calculated by timer in 1/100 second, here 0.74 s. advance.

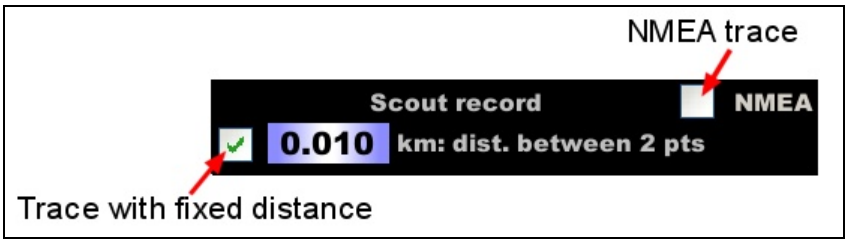
Remarque : latitude longitude can be copy/pasted in GoogleMap (after removing « ; »).

The files can be copied in a USB drive when inserted, then archived (see above).

13.2 GPS trace during scouting

Two GPS traces can be recorded (**outside of race**) when enabling the recording function.

To access this function, in the main menu, push the USB drive button 



The recording **starts and the files are created when Trip1 is reset to 0**. A red point pictogram appears on the screen.
The recording stops when stopwatch is armed (no need to trigger, just arm). *A more friendly stop function is to be added to firmware.*

The files are copied automatically in a USB drive when inserted, then archived (see later §). They can be visualized and/or converted in different formats, for example with:
GPS Visualizer see http://www.gpsvisualizer.com/

13.2.1 Traces with fixed distance

It is a trace that records a point after driving a configurable distance. This distance gives the precision but also the weight of the generated file. 10 m is a good compromise between accuracy and size.
In the **Recording** page, push the button on the left and enter the desired distance between 2 points recorded for the "fixed distance" trace. It is interesting to record this trace during GPS auto-correction waypoint recording. It associates waypoints with distance on every wheel. Then it allows to add correction points in the GPS waypoints file, after the end of scouting, once back in office.
File name is: **`Scout_date_hour.csv`**
The format is the following:

GMT Hour	Left	Right	AuxLeft	AuxRight	Lat	Lon
134304	0	0	0	0	45.0149405	5.63988717
134347	0.01	0.01	0.01	0.01	45.0148463	5.63988683
134349	0.02	0.02	0.02	0.02	45.0147582	5.63988

- **GMT Hour** is the time-stamp from the GPS. In France, add one hour in winter and 2 hours in summer.
- **Left** and **Right** distances are the main sensor input distances (non driving wheel),
- **AuxLeft** and **AuxRight** distances are the auxiliary sensor input distances (often driving wheel).

Note: **Aux** check box has to be checked in "car configuration wheel choice". *In this firmware version, only "Peugeot/Citroën ABS" OBDII configuration is compatible with function*,
- latitude and longitude in degrees. Can be copy/pasted in GoogleMap (after removing « ; »).

13.2.2 Traces with fixed time (0.1 second)

An **NMEA trace** (historical GPS protocol) can be recorded checking the check box on the upper right corner. Raw data from the GPS are directly recorded, so 20 lines every seconds! This trace is not concern by Trip1 distance and can be used to simulate the GPS on desk or can be converted in GPX or KML file. It is not recommended to record this trace during scouting if you stop often to hand write landmarks because the files become huge.
File name is: **`GP_date_hour.csv`**

13.3 Correction waypoints during scouting

Please see annexe document for this function. GPS auto-correction option is needed.

14 “Gravel crew” notes announcement

This function makes it possible to semi-automatically adjust distance from the distances entered in advance (while preparing the road-book). A few tens of meters before the correction point, the new distance popup is displayed exactly as if you had typed the distance. Just have to validate (OK key) or cancel (BACK or EXIT key).

This function is used to announce the notes taken by the “gravel crew” as follows:

- - display of the note in a popup window with a yellow background on the co-pilot screen:

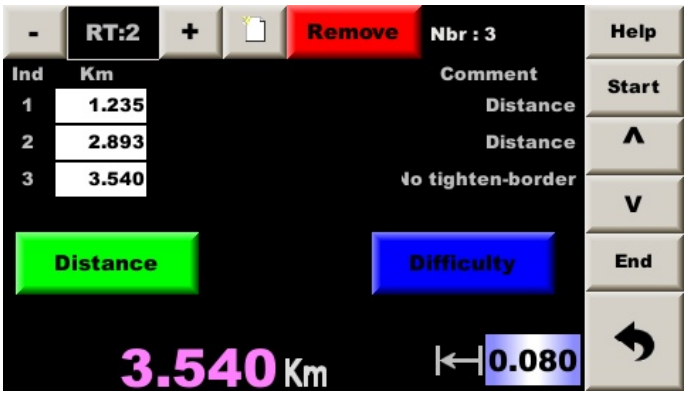
- - display a popup with a panel on the RP380 driver screen (with program version 190122 or later):


or or

For: water runoff or snow / ice or "Not rope" respectively

- - with HUD module Led6: yellow flash + long beep.

The notes are taken by pressing a button (or remote control with corresponding numerical key):



- enter the distance,
- green button for a semi-automatic correction or
- blue button for a note, then button or remote control with corresponding numerical key to select the note to announce.

Bottom right: distance at which the note is announced before the arrival on the note (here 80 m).

The function is accessed by the button located in the ZR management screen:  or long press the page key on the remote control.

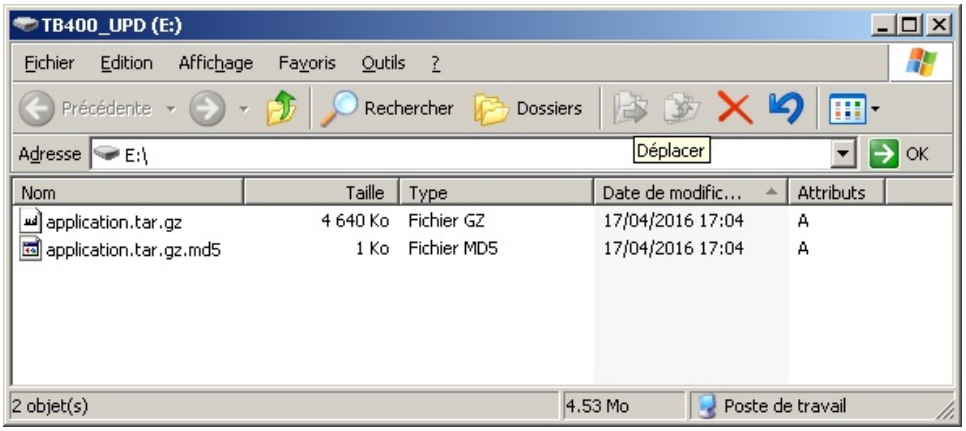
The function must be enabled in the guidance options page (top).

15 Firmware updates

The program update includes the files **`application.tar.gz`** and **`application.tar.gz.md5`**.

You have to copy these two files on a USB drive, so that you have them at the "root" of the drive.

Important: **do not unpack (unzipp) the files!**



Insert the USB drive into the connector, the dash read it. In the screen automatically opened, a button appears **if both files are found at the "root" of the drive**:

Press this button to go to the system update screen and press the button corresponding to the desired update:

The timer displays a popup asking not to turn off the power or remove the USB key.
The USB key can be removed once the program restarts.

16 Welcome picture update

Prepare a file with 480 * 272 pixels size and .PNG format. The name must imperatively be "**`logo.png`**".
Place this file on a USB drive formatted in FAT32 (in the root).
Insert the USB drive into the connector, the display reads and updates the welcome picture (first and longest part only).

Note: on RR420, picture has to be drawn upside down.