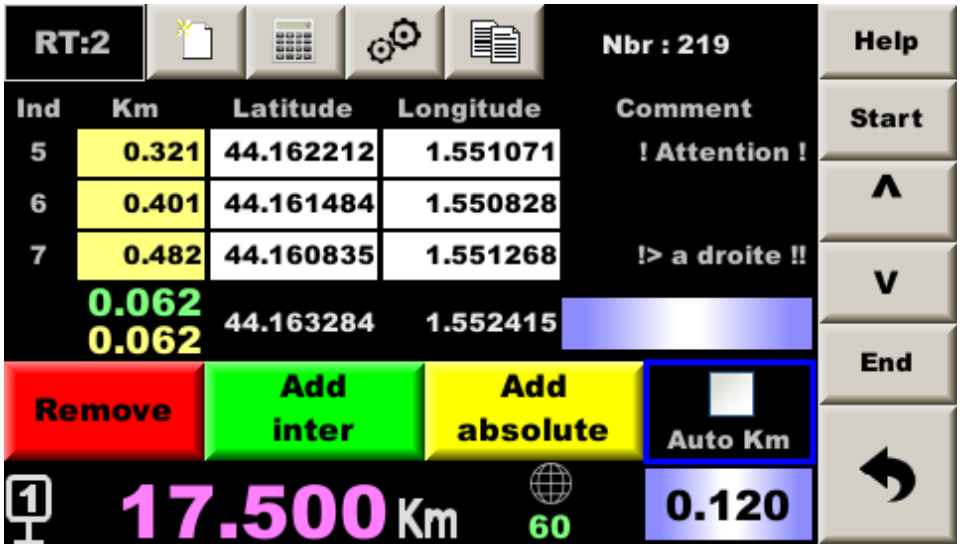
RR400/420 Regularity timer Annexe



Distances auto-correction by GPS

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Important: videos explaining the operation of the device can be viewed on **CRISARTECH *Youtube channel***:

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

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1 Principle of distance corrections

During the race, Trip1 distance counter serves as a reference for calculating and displaying the advance or the delay. It is therefore essential that this distance is as accurate as possible with respect to the distance used by the timekeepers.

But this distance always shifts slightly for two main reasons:
- calibration is never quite precise. It is calculated over a few km whereas the RT can reach several tens of km. An inaccuracy of about 2 m on the calibration zone (1 m at the start + 1m at the finish) will result in a 20 m inaccuracy in a RT with 10 times the length of the calibration zone,
- difference of trajectories between the organizer who "traced" the RT and the pilot. Between two different paths to approach a pin curve, we can have several meters difference, for example.

The only way to be precise is to regularly correct the Trip1 (several times per km). This requires to make the scouting or reconnaissance run when possible and to take couples "landmark / distance", that is to say that at each landmark, we will associate a distance during the reconnaissance. Then, during the race, arriving at the landmark we will correct the Trip1 with the distance that was noted during reconnaissance. There are two ways to do this:
- use visual cues (signs, km markers, posts, recognizable buildings ...), described in a notebook or photographed,
- use GPS waypoints (CRISARTECH invention that is starting to be copied by the competition), recorded during reconnaissance (§ following) and that the device "unrolls" automatically during the race. It is simple and more precise, especially in case of snow, fog, night...

The distances measured must also be adjusted to the distances in the organiser's road book, or those of the timekeeper if he does not follow the road book exactly. This is what we call '**normalization'**.

Automatic correction by GPS is compatible with RTs with shifted start, see general manual §*17 Shifted start* and in this manual *§10 Shifted start with GPS autocorrection*.

2 Principle of CRISARTECH GPS distance corrections

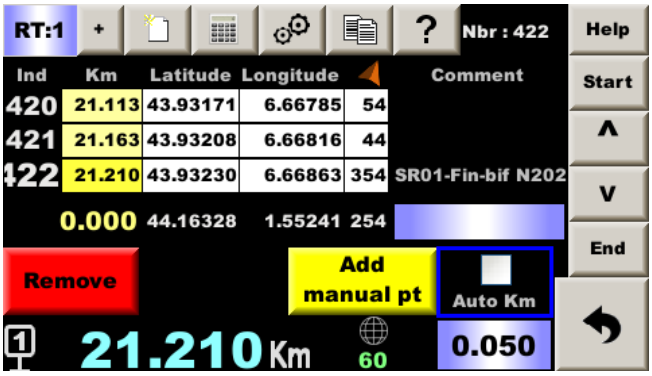
2.1 Where to record correction waypoints?

The CRISARTECH system can record correction points in two ways:

- **manually**: the user presses the yellow button (remote control or touch screen) when he wants to record a correction point. If the user enters a comment **before** pressing the button, the comment is written on the same line as the GPS coordinates and the distance. These points must be placed regularly to avoid distance shifts due to trajectories or possible small measurement inaccuracies (calibration not perfect, GPS measurement),
- **automatically**: the device will record points at a fixed distance by checking the **Auto Km** box. The recommended interval between two points is **0.03 to 0.05** km.

2.2 Recording screen

In the 'RT management' screen, push the satellite button  or short press on **page** key of the infrared remote control:



Push the yellow button to add a waypoint (yellow key on the remote control).
Push the red button to remove the last waypoint (red key on the remote control).
Check/uncheck the **Auto km** checkbox to start/stop auto selection points (blue key on the remote control).

Maximum number of points per RT: 990

2.3 Files

Each time a key is pressed, the timer adds a line to a file named gps_zrxx.csv, for each RT (xx represents the RT number). **There is no need to save the file at the end**, this is done at each point. Files are transferred along with distance / speed files using the **import / export** buttons (buttons on the left in the page that opens when a USB stick is inserted).

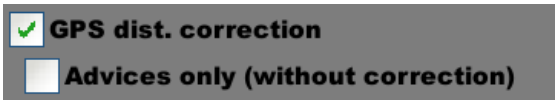
The format is:
`point_type;distance;latitude;longitude;course;comment`
with:

- point_type: **D** for waypoint taken by hand, **d** for automatic waypoint,
- distance in meter,
- latitude in degrees,
- longitude in degrees,
- course in degrees,
- comment: 25 char maximum text.

Note: in older files, you can find point types **I** for Intermediate waypoint and **A** for Absolute waypoint taken by hand, **a** for automatic absolute waypoint,

2.4 Access to the function

The function must be enabled in the guidance options page (middle tab) of the main menu:



The second box (expert mode only) should be checked only if you want advice without correction: **after pressing the blue button on the remote control in the main page, at each point, the system gives the lead or delay distance but does not correct!**

Note: The use of heading in the GPS correction strategy is no longer optional. **Heading is used systematically**.

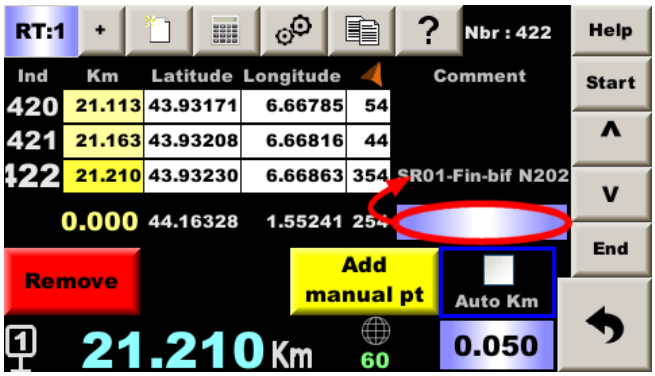
If the checkbox **GPS dist. correction** is not present, the option has not been validated, please see main manual §*22 Optional functions purchase / activation / deactivation*.

2.5 Comments

You can enter a comment that will be added to the file, at the end of the line. These comments are useful (indispensable?) to find one's way easily in files which may have several hundred lines. The last point (RT finish) should always be commented. Indeed, it may happen that points are added after the finish (forget to uncheck **auto Km**, or for reference in the next link...) and you must then be sure of your finish point to adjust the length of the RT measured to the length given by the organizer.

Note: for normalization at the end of scouting, comments are even essential.

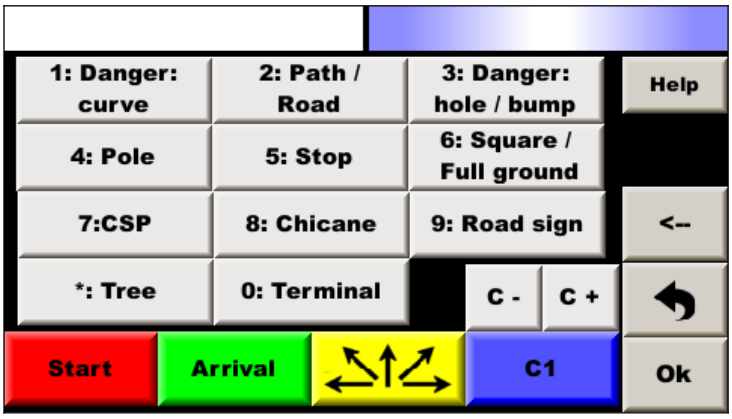
2.5.1 Entering a "text" comment



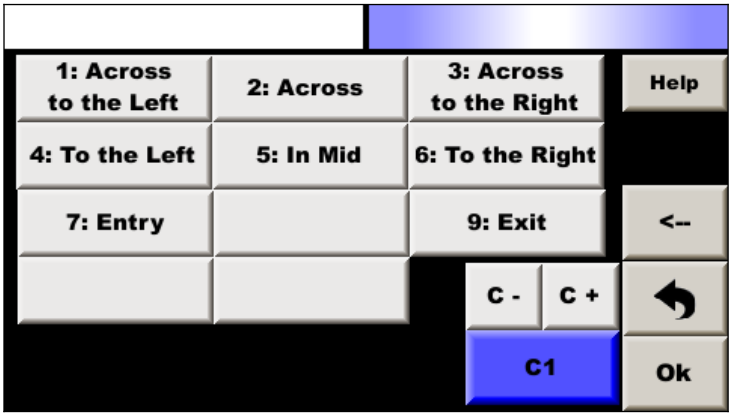
Important: comment must be entered **before** pressing the button.

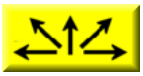
Two possibilities:

- with infrared remote control:
  - press **page** key
  - press numeric or colored key corresponding the desired text
  - validate with the **OK** key
- with the virtual keyboard:
  - press the comment input field (see red ellipse in picture above)
  - press the button corresponding to the desired shortcut and/or
  - press the text entry field at the top right of the page that opens (see below), then type the text on the virtual keyboard
  - press twice the **OK** key

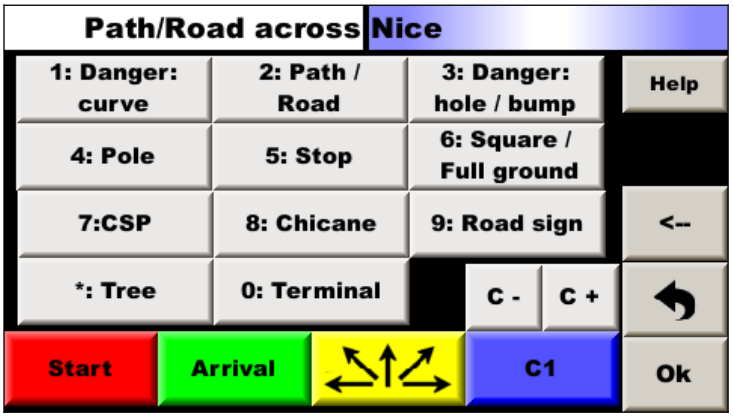


After pushing a button describing a landmark (bend, post...), the page changes to buttons allowing you to specify the place of this landmark (right, left...):



Note:  button allows direct access to this page.

Shortcut button(s) and keyboard can be combined to quickly enter a relevant comment:



Press the **Path/Route** button (touch or key 2 on the remote control),
then press **Across** (touch or key 2 on the remote control,
then text box at top right to bring up the keyboard and type **Nice**.

2.5.2 Entering a comment while following a road book

The blue button directly enters a comment with **C** and a number which is automatically incremented. This is used when following a road-book and entering a point in each road-book box. The first box in the road-book is marked with the comment **C1**, then the second with **C2**... Intermediate comments can be entered, and if the blue key is not pressed, the index is not incremented. Conversely, if you do not take a point in one or more road-book boxes, you can then manually advance the index by pressing the **C+** button above (or the **+1 m** or **+10 m** button on the remote control) and conversely **C-** to go backwards.
There is now a small input field above boxes **C-** and **C+** to indicate directly the number of the next box, if the box numbering is not reset to 0 at each ZR.

Important tip: it is possible to record the distances of each box of the road-book before carrying out reconnaissance using the '**semi-automatic corrections**' function, see main manual §20. This has several advantages:

- before arriving at the point corresponding to the box in the road-book, the **distance to the box is displayed** along with the **regressive distance**,
- **two audible alerts** warn you that you will reach the marker. When you're doing reconnaissance alone, this makes it easier to concentrate on the trajectories, knowing that you'll be warned when you need to slow down and watch out for the marker,
- when the point is validated, the **road-book distance is recorded** after the comment, separated by a semi-colon. This means that when you want to normalise (using a spreadsheet or the built-in function), **you will no longer need to enter this distance**. If the time is counted between the reconnaissance and the race, this saves a lot of time.

2.5.3 Comments to be displayed during the race

If the comment begins with an exclamation point: the comment will be displayed during the race on the timer, accompanied by a long beep and a light sequence on the Led6 module:

Comment	Light sequence on the Led6
!	Double yellow flash
!>	Mauve mover from left to right
!<	Mauve mover from right to left

Example : avec comment !> To the Right!!, the following popup window will be displayed:

Note: you will have to press the popup window or a key on the remote control to close it.

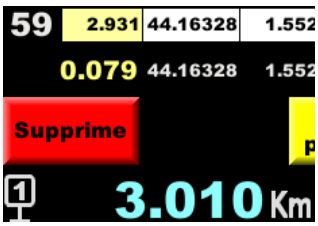
2.6 Automatic WP entry

The automatic entry allows you to automatically enter points at a fixed distance. This distance must be entered in the bottom right-hand corner and the check mark above it must be ticked: 

2.7 Partial counters

A counter helps you to know at each moment the distance from the last waypoint.

Example: when current distance is 3.010 km, you know that the last point had been taken 70 m before:



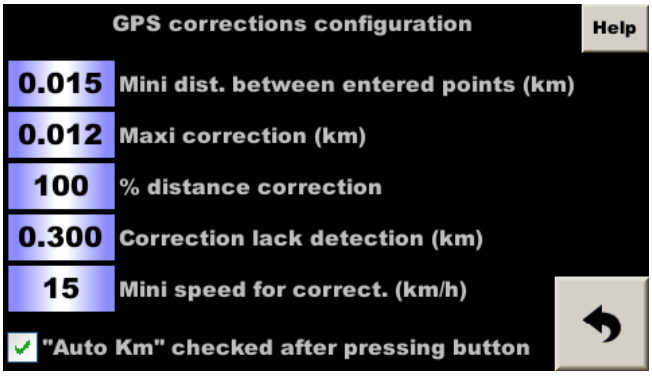
2.8 Distances on 2 or 4 wheels

The system creates automatically a second file named `gps_det_zrxx.csv`, for each RT.
This file contains each wheel distance (the 4 wheels if Peugeot / Citroën with **auxiliary wheels** checked). It is useful if one prefers to make calculations quietly on his computer while returning at office, rather than a simple normalization during the Scouting.
It can not be used directly to make corrections because there are several distances and the system does not know which one to use. That's why it is registered in addition.
The format is:
`point_type;RL_dist;RR_dist;FL_dist;FR_dist;GPS_dist;quality;latitude;longitude;course;comment`
with :

- point_type: D or d,
- `RL_dist`: rear left wheel distance in meter,
- `RR_dist`: rear right wheel distance in meter,
- `FL_dist`: front left wheel distance in meter,
- `FR_dist`: front right wheel distance in meter,
- `GPS_dist`: GPS distance in meter,
- GPS reception quality (0 to 99),
- latitude in degrees,
- longitude in degrees,
- course followed by GPS in degrees,
- comment: 25 char maximum text.

3 Configuration

Use the button  to access the configuration screen:



The first parameter defines the minimum distance between two points entered (during reconnaissance). Indeed, when a point is entered manually, it may be just after a point taken automatically. Or it can happen that you press the button twice. In the default configuration, if an **automatic** point has been taken at less than 15 m. before a manual point then the automatic point will be deleted. **If the previous point is a manual point**, the device will ask if the previous point should be deleted.

The second parameter defines the maximum correction applied during the race. With the default setting, if a correction of more than 12 m. occurs, it will be ignored (the unit displays **Pass** in the history at the bottom right), this is to avoid abnormal corrections that may occur during occasional signal disturbances. If the correction is really more than 12 m. then it will be applied at the next correction point.

The third defines the percentage of correction that is applied to each waypoint.
For **open road rallies**, we don't cut many corners, so we can set a percentage of around **60%.** If the system calculates that there is a 10 m error, it will only correct 6 m. This filters out some of the false corrections that can occur in areas with poor GPS reception. However, this means that **the waypoints must be fairly close together** (about 70 m), because if a large correction is needed, it will be spread over several points.
On the other hand, for **rallies on closed roads**, the bends are cut off and it is advisable to set **100%**.

The fourth parameter defines the distance without correction after which a **search for the nearest point is started to resynchronise the system**. The default is 300 m. That is, if there is a missed point problem and the system goes out of sync, automatically, after 300 m. it will resynchronise.

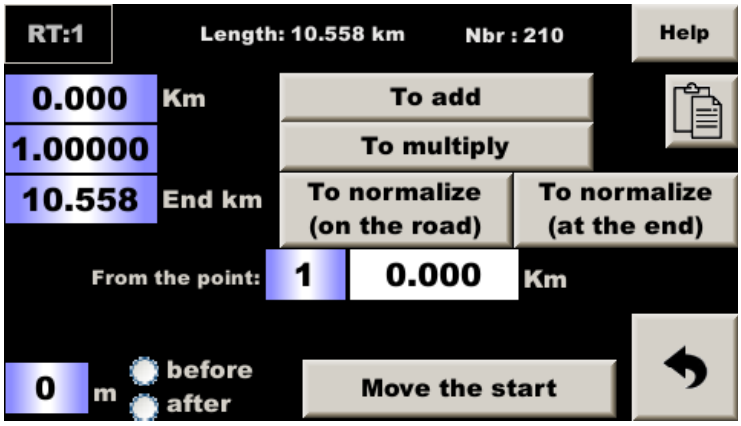
The last parameter indicates **a vehicle speed threshold below which corrections are not applied**. Indeed, at very low speeds (e.g. queuing for the start of a special stage), corrections can be random.

The checkbox below allows you to automatically reactivate the automatic entry of yellow waypoints after manually entering a point, yellow or green. This ensures that you do not forget to reactivate the automatic entry if you deactivate it just before entering a point manually, when arriving at a sign, or when approaching a hairpin.

4 Distance adjustment

These operations are very important: the distances measured must be adjusted as closely as possible to the distances in the organiser's road-book or the timekeeper's road-book if the latter does not follow the road-book exactly (the timekeeper can re-measure everything when he takes his timing points).

Distance adjustment screen is accessed with  button (calculator pictogram):



The most commonly used function is ‘normalization’. The others are more anecdotal, designed to deal with rare cases of departure or arrival displacements, and are intended for regularity experts.

4.1 Addition

To add a distance to the entire table, enter this distance (with minus sign if subtract) in the first field then press button: **To be added**.

This is equivalent to **simply move the starting point**:
- a distance is added if you leave earlier than planned (you travel more distance),
- a distance is substracted if you leave further than planned (you travel less distance).

The question then arises as to whether a normalisation should not be carried out afterwards:
- you have to normalise if you consider that you have made a mistake during the reconnaissance: you have not taken the right starting point and you have just corrected it by adding or subtracting a distance. But the total length must be reset to the length given by the organiser, **see how to chain the two operations in a single command, §4.4,**
- it should not be normalised if the organiser has changed the start since the reconnaissance (works, unhappy resident...). If the new total distance does not match the organiser's new distance, this is not a problem because the difference is after the finish. Note that if the start is "further away", which is often the case when modifications are made, it may be easier to use the shifted start, see §9.

4.2 Multiplication

To multiply the entire table by the same coefficient, enter this coefficient (or its inverse to divide) in the second field and then press button: **To be multiplied**.

This is equivalent to a change of calibration.

4.3 Normalization

When the organizer gives cue points, it is possible to use them to fine adjust the distances taken during scouting by performing a "rule of three" calculation on the table.

A quick normalization can be made between the start and finish points. It's a bit crude, but if you've managed to drive in the same way as the organiser, it's simply a matter of adjusting the calibration of your measurement to that of the organiser.

A more detailed normalization can be carried out using the intermediate boxes in the road book. It is possible that our driving was close to that of the organiser in the zones with fewer bends and more different in the zones with more bends. In this case, standardising only on the finish corrects less well and leaves some small differences 'in the middle of the RT'.
This finer normalization can be done in 3 ways:

- **as you go along, at each stop on the road**. This requires you to remain stopped for several long seconds on the road, which can pose safety problems in relation to other road users, both local and especially rally drivers on reconnaissance. What's more, **you don't have the benefit of hindsight** because you don't yet know what error you might make on the next point, and so it's harder to spot any contentious points (an error on your part or on the organiser part). Finally, it's difficult to go back on a correction if you've made a mistake or if the organiser publishes a distance correction,
- **on the computer at the end of the reconnaissance**. Using a USB key, you extract the data, process it with a spreadsheet (modifying distances only), then import it into the device. **This requires some expertise in spreadsheets** and introduces the risk of obtaining a file that is not compatible with the system. If the RTs are long and include a lot of points, the time required can be as much as an hour per RT,
- **on the device** with a new optional function. Once you've finished recording the points, you fill in a table with the organiser's distances and the device automatically adjusts all the distances.

In all cases, you stop at each square in the road-book, take a GPS point and add a comment.

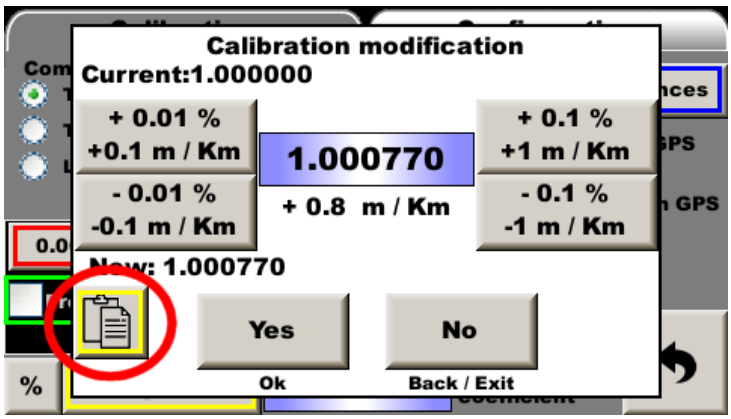
4.3.1 Normalization on the road

In each box, if you think that the distance measured is consistent with that in the road-book, display the page above and enter the road-book distance in the Km RB field. Then press A normaliser (on the road):

- the device searches for the last corrected point that it considers to be correct. You can check its index in the From point underneath field (which can be modified in the event of an error), as well as the associated distance,
- the last point entered will be adjusted to match the "right" distance by multiplying by a correction coefficient computed by the device,
- this same correction coefficient (displayed in the second field: **To be multiplied**) will be applied to all intermediate points between these two reference points.

Note: if you want to simplify the procedure and normalise only once at the end (the rather crude method described at the beginning of this paragraph), you proceed in the same way at the last point. From the point will indicate 1 for the first point. The A multiplier field will correspond to the correction coefficient that should be applied to the calibration to make it ideal for this RT.

The **Copy** button  appears. When pressed, the correction coefficient calculated during the normalisation (displayed just to the left in the second **To be multiplied** field) is stored. If you then go to the fine calibration correction, this coefficient is *pasted* by pressing the same button into the calibration correction coefficient, which avoids retyping the number:



Example:

- at the start, we take the waypoint 1,
- following the road we take 8 waypoints, from 2 to 9,
- we arrive at a box of the road-book bearing a precise landmark and the distance 2.482 km, while Trip1 indicates 2.490 km. We then normalize, between the waypoint 1 (0.000 km) and the waypoint 10 brought back to 2.482 km. The distance corresponding to waypoints 2 to 9 is modified accordingly,
- following the road we take 9 waypoints, from 11 to 19,
- we arrive at a box of the road-book bearing a precise mark and the distance 9.658 km, while Trip1 indicates 9.649 km. We then normalize between waypoint 10 (2.482 km, the last waypoint considered "right") and waypoint 20 increased to 9.658 km. In the field **From the point** there must be 10 and the distance associated, on its right must be 2.482. The distance corresponding to waypoints 11 to 19 is modified accordingly ...

Important: **do not forget to enter the waypoint corresponding to the marker (arrival or intermediate point) before performing the normalisation!**

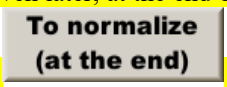
4.3.2 Normalization with a computer

To make it easier to find your way home or back to your hotel, **it is strongly recommended that you enter a comment for each point taken manually** for each box in the road-book. The minimum comment is the box number. There is a specific procedure for this, see *§2.5.2 Entering a comment while following a road book.*

It is possible to manipulate all the data, delete lines or add new ones (for example from the GPS track recording file for reconnaissance at a fixed distance, see the main manual). **It is not advisable to modify the GPS coordinates, but rather the distances**. When putting the files back into the device, follow all the advice in *§7 Files import*.

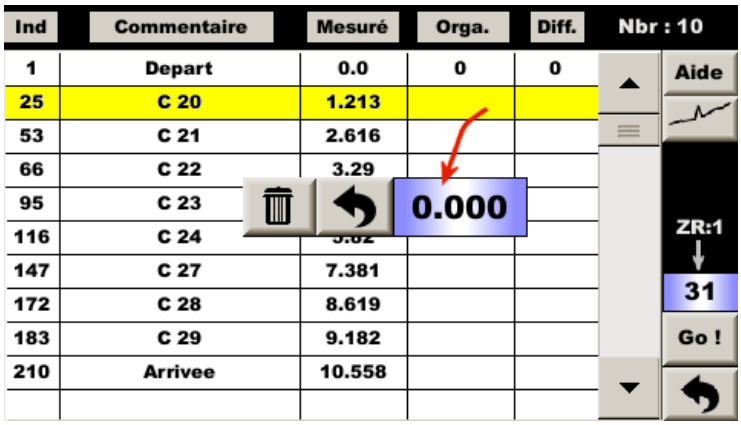
4.3.3 Normalization on the device, at the end of RT

In this case, **it is imperative that you enter a comment for each point taken manually** for each box in the road-book. The minimum comment is the box number. There is a specific procedure for this, see *§2.5.2 Entering a comment while following a road book.*

At the end of the ZR or even later, at the end of the day or at the end of the reconnaissance, press the button on the distance adjustment page 

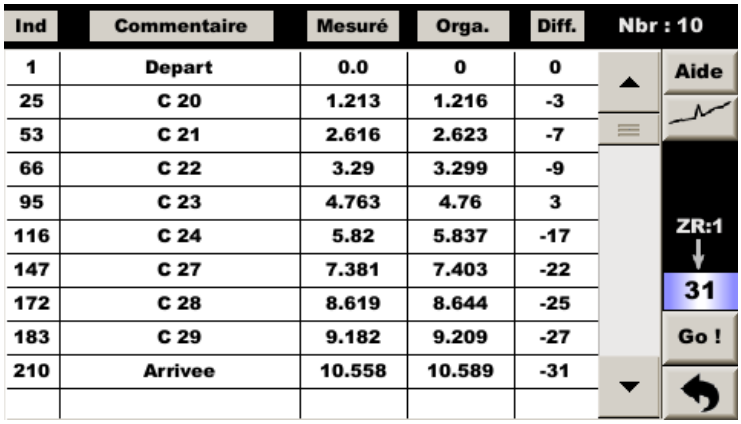
.

The system analyses the file and extracts all the lines with a comment and writes them in the table. The **Orga** column must then be completed. Press on each line to display an input field:

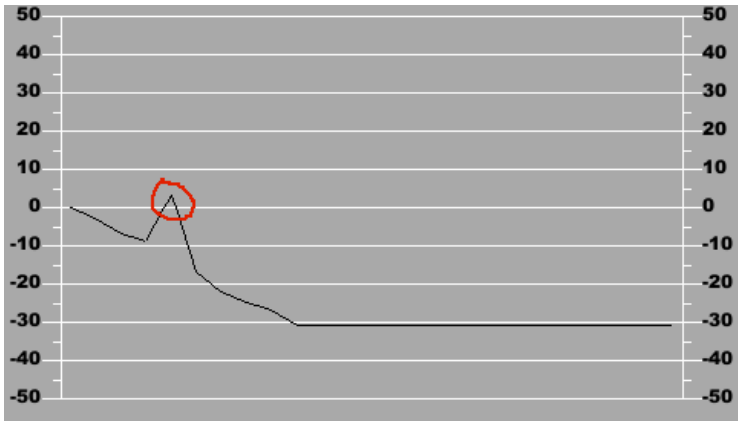


The difference (measured distance minus organiser distance) is calculated automatically in the next column.

Important tip: if the RT has been prepared using the road-book distances as indicated in *§2.5.2 Entering a comment while following a road book*, the **Orga** column will already be filled in!



Use the button  to display the data graphically. This makes it possible to detect points that are measurement errors (on our part or on the organiser part) because they are 'outside' the graphically displayed trend:



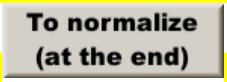
We can clearly see the line corresponding to box **C23**, which has a difference of +3, while the other differences progress negatively (-9 before, -17 after). We can remove this line from the table by pressing the line again and then the button  .

On the right, the device suggests the number of the RT in which it will record our normalized RT: 

. By default, for RTs with a number less than 30, it will suggest the number plus 30, as in this case, it will suggest saving RT1 as RT31. And if the number is greater than 30, it will subtract 30. This allows the measured data to be saved in case of a mistake or if the organiser publishes corrected distances at a later date.

All that remains is to press the button 

.

Note: this new function is available as an **optional extra for devices purchased before the September 2024 update**. If the option has not been added, the button 

will not be displayed.

4.4 Moving the starting point

If, on arriving at the start of a stage, you realise that you have made a mistake during the reconnaissance: you have not taken the right starting point. You must then correct by adding or subtracting a distance (don't make a mistake with the sign!), then the total length must be reset to the length given by the organiser. This last function will chain the two operations in one command:

- enter the distance of the change in metres,
- check **before** if the actual start is **before** the start of the reconnaissance, or
- check **after** if the actual start is **after** the start of the reconnaissance,
- press the **Move the start** button.

5 Data duplication

In the case where a RT is performed several times, the GPS auto correction data can be duplicated using the button:

This makes it possible to prepare different distances / speeds for the same RT.

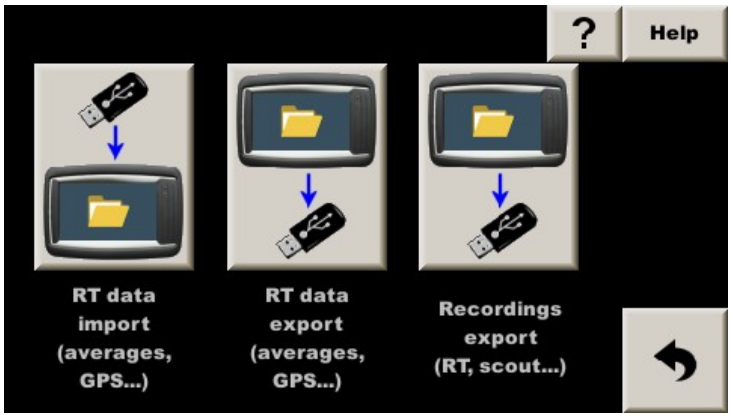
6 Files export

6.1 Correction files export

You can export the GPS correction files:

- save to computer,
- rework the files: delete points, modify distances... see below,
- share between crews...

Insert a USB key in the drive. The transfer page opens automatically after a few seconds:



Press the **RT data Export** middle button. The button is pressed and after a few seconds the LED on the USB flash drive flashes. Wait a few seconds after the light stops flashing and the button is pushed back in. Then remove the USB flash drive.

6.2 GPX format export

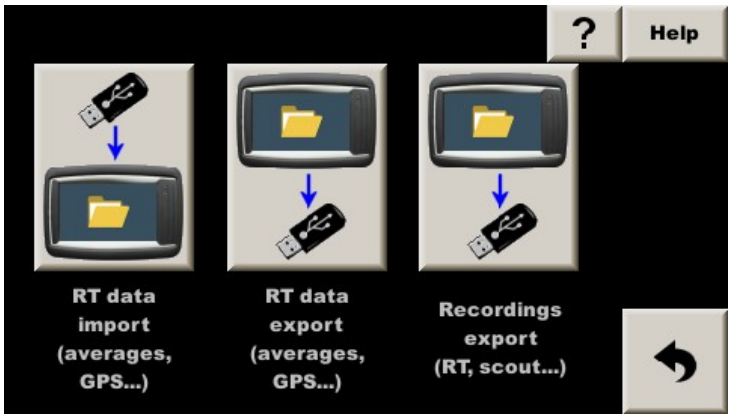
The device automatically creates two files in the universal GPX format (*GPs eXchange*) from the waypoints of each RT, with two compatibility modes:
- files with names ending in **_Gar** are more likely to be opened with *Garmin Basecamp*,
- files with names ending in **_Goo** are more likely to be opened with *Google Earth*.

These files are created and transferred at the same time as the above files. That's why this copy function takes about 10 seconds.

7 Files import

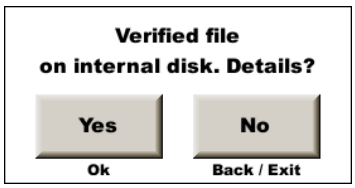
You can import GPS correction files:
- files that have been saved on a computer,
- files that have been reworked on the computer,
- shared between crews...

Copy the files to a USB key at the ***root*** and insert the key in the drive. The transfer page opens automatically after a few seconds:



Press the **RT data Import** left button, then confirm the replacement of the files in the cadencer. Once the copy is done, the system counts the files found in the internal memory of the device and displays the number of RT files (with average distances/speeds) and the number of GPS correction files:

The device then begins a detailed verification of the files. After a few seconds, it proposes to consult the details of this verification:



By pressing **Yes** or **Ok** on the remote control, the following table is displayed:

Ind	Seg	WP	Length	Distance	Nbr : 17
1	15	373	23.382	~63 km	
2	3	315	26.67	~54 km	
3	4	581	38.524	~54 km	
4	3	314	19.023	~52 km	
5	5	140	13.71	~50 km	
6	2	695	62.079	~45 km	
7	3	494	35.072	~41 km	
8	4	551	62.053	~42 km	
9	5	282	20.384	~51 km	
10	4	566	36.27	~52 km	
13	10	580	45.065	~50 km	

One can then check that the lengths, **WP** (number of Waypoints), distances *as the crow flies* are consistent with what one wanted to import. If the average distance/velocity files are in the device (entered manually before import or imported at the same time as the GPS correction files), one can also check the number of distances/average speeds found in each file (**Seg**).

This table can be recalled at any time by pressing  button, found at the top right of the file transfer page. And to recall this page without having a USB stick present, simply press the **Exchange with USB** button on the **RT management** page: 

Remarks:

- GPS receiver must have connected to have the distances *as the crow flies*,
- when leaving the **RT management** page or arming the stopwatch, the cadenceur loads all the files in memory and displays the number of speed segments (Se), the number of reset points (WP) and calculates the distance as the crow flies to the start of the RT (this allows you during the race to make sure that you are going to take the start of the RT at a few tens of meters with the right data and not the data of the next RT at a few tens of Km):

RT1 / 15 Se
373 WP / Start ~63 km

- it is advisable to delete the files already in the device (previous rally?) before importing the new ones. Press the "trash"  button at the top right of the **RT management** page. **Be careful, this also deletes the average speed/distance files!**

8 During the race

Once the stopwatch is armed, the device looks for the first correction point (but numbered 2, because point 1 is the starting point, on which no correction is made). Once it has found it, it corrects and then moves on to the next, and so on until the end of the file.

The correction is displayed in the bottom right-hand corner and you can see the history of the last 5 corrections. The letter **G** in front of the value indicates that the correction was made using GPS. Negative corrections (distance shortened) are shown in blue and positive corrections in yellow. The colours are clear when the corrections are a few metres and accompanied by a green flash from the device built in LED. The colours are brighter when the corrections exceed 6 metres and are accompanied by a yellow flash from the device built in LED.

If the correction is '-0 m', this means that it is between 0 and -1 metre.

Since precision is around 2 metres, when the pilot is following a trajectory close to the one used for reconnaissance, the corrections generally remain between -2 and +2 metres, but depending on the nature of the terrain, they can occasionally be a little higher.

Note: in the event of a cut bend on a wide road, the distance may be extended by more than 10 metres.

If you are in **Advice only** mode, the letter **G** is replaced by **D**. If the co-driver does not correct the distance using this advice, the difference will increase (cut bends, for example).

Note: the function really start when the stopwatch is armed (first press) and not when the stopwatch is started, as corrections may be required BEFORE the start of the stopwatch, see below, shifted starts.

But in some cases, it is not possible to make a precise correction and the device will display **Pass** in the history frame. This happens in the following cases:

- the point is missed because it was seen too far away (accuracy problem during reconnaissance or during the race). In the log file, the point will be marked **W**,
- the point is missed because the correction is greater than the maximum correction defined in the configuration. In the recording file, the point will be noted **X**,
- the point is missed because the speed is lower than the minimum speed defined in the configuration. In the recording file, the point will be noted **Y**.

Remember: if everything goes well, the point is noted **G** in the file and **D** if it is only an advise.

9 In case of problems

If the timer has a power supply problem, when it re-starts, it will not know which GPS auto correction point to seek. It can also happen in very rare configurations of very tortuous roads, if the number of points entered is insufficient.
In all those cases in which the system seems to be "lost", such as after 300 m. without having succeeded in resetting (configurable), it will automatically search for the nearest point in the whole table of points it has in memory.

It is possible to force this search manually by pressing the button 

in the main menu as soon as the stopwatch is running.

10 Shifted start with GPS autocorrection

When we do reconnaissance and we don't know the exact starting point of the RT, the departure of the reconnaissance cannot be the same point as the departure of the RT. We will then start the reconnaissance before the earliest estimated starting point to be sure, on the race day, to start the corrections BEFORE the start of the RT. This had often been the case for the Monte-Carlo rallies.

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 to 0 at the A village exit sign or better, on a road book note. It is our **reconnaissance 0 point**,
- we take our road to B village by taking our correction points, stopping preferably on a road-book note, **to be able to carry out a normalization,**
- the race day**, we reset our Trip1 to 0 at the 0 point of reconnaissance**. As we use GPS correction , **we arm the chrono** (press **once** on the chrono or the chrono button to popup the chrono panel),
- corrections begin while we drive towards the secret departure of the RT,
- **at the start of RT, do not reset Trip1 to 0**,
- we begin the RT by starting the stopwatch as usual (preferably using automatic start at time) 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…

For the changes of average speed, see general manual § Shifted starts

10.1 Function activation

To do this, check the box **Shifted start** in **Guidance options**, middle tab. 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.

10.2 Automatic starts detection

Important: you **must remember to arm the stopwatch at the 0 point of the reconnaissance**.

It is to avoid this oversight that we have developed a function to arm automaticaly the stopwatch at **point 0 of the reconnaissance**, see **guidance options**, middle tab:

With that function, when you arrive about 100 m before **point 0 of the reconnaissance, the system automatically**:
- **detects the RT** you arrive and switches to this RT,
- **reset your Trip1** to about -100 m (you are about 100 m before the point),
- **arm your stopwatch**.

A range of RTs to be searched can be specified, **general manual § Guidance options**.

Warning: **if the system is asked to start at RT 1 (as in the example above) but cannot find the gps_zr1.csv file, it will display a configuration error message** and the search for starts will not work, even for other files in the device's memory.

10.3 If you have not set the time at the start of reconnaissance

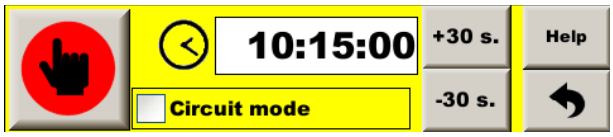
When you arrive at the starting point of the RT, the distance will not correspond to the distance measured during the reconnaissance (cut curves, calibration not exact ...). If we take the start like this, the first automatic correction will correct your distance following the distance measured during the reconnaissance but will create a difference compared to the departure of the RT and therefore an error.

To overcome this, **there must be at least one correction before the start of the RT.**

Here is an **emergency procedure**, to use in the case **you arrive to the real start and you did not arm your stopwatch** (and only in this horrible case **which should never happen thanks to the automatic detection of departures**):

With the infrared remote control:

- arm the stopwatch (press the stopwatch button once) at least 200 m. before the start of the RT (make a U-turn if necessary) to make the stopwatch setup panel appear,



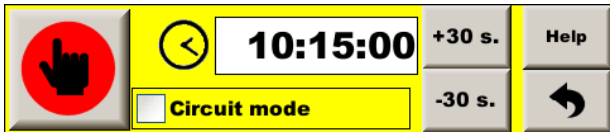
- "Menu" button to access the main menu,
- "GPS magic!" button on the right of the screen (see above).

Without the infrared remote control:

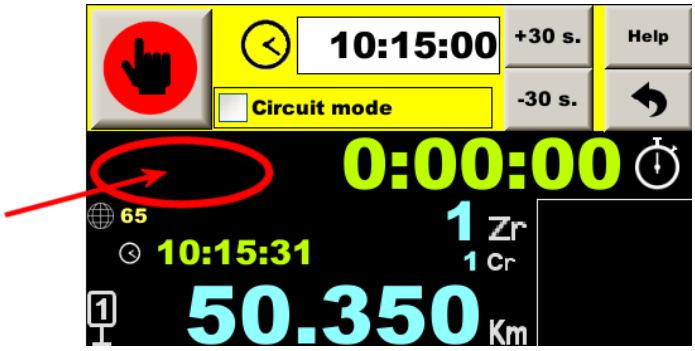
- check that at least one other page than the "co-pilot" page is allowed. It **must not be configured** as follows:

If this is the case, press at least one red cross to allow the display of another page (here the "link" page):

- arm the stopwatch (one press on the stopwatch or two in "beginner" mode) at least 200 m. before the start of the RT (make a U-turn if necessary) so that the stopwatch adjustment panel appears:



- press twice in the page change zone:



- on the new page, press the top menu button  to access the main menu,
- "GPS magic!" button on the right of the screen  .

In both cases, go forward to have **at least one GPS correction before the start of the RT**. If not, repeat the operation further from the start.

Next RT, please think to arm the stopwatch, it is much easier than do this emergency procedure!

10.4 How to approach the start with confidence?

The distance of the Trip1 at the start of the stage is very important. If it is wrong, the error will be duplicated at each checkpoint of the stage.

As the correction is not applied below 15 km/h, you should not stop at the reset point. Besides, there is no point, it is automatic.

When you are in a queue before the start, avoid moving slowly, by small distances. The GPS measurement could miss a few meters each time and the distance to the start would be too short. It is better to wait for the space of 2 or 3 vehicles and move forward frankly, exceeding the correction speed threshold (15 km/h by default).

When you are stopped waiting for the start in an area of poor reception, the GPS may "crawl", i.e. move forward without the car moving and the start distance would be too long. The co-driver can check that the distance does not move and if it does, he must remove the metres that have been added with the touch screen as the remote control is used to change the start time (by pressing the right-hand part of the distance displayed at the bottom of the screen). It can also freeze the distance, which avoids having to remember the initial value (by pressing the left part of the distance displayed at the bottom of the screen).

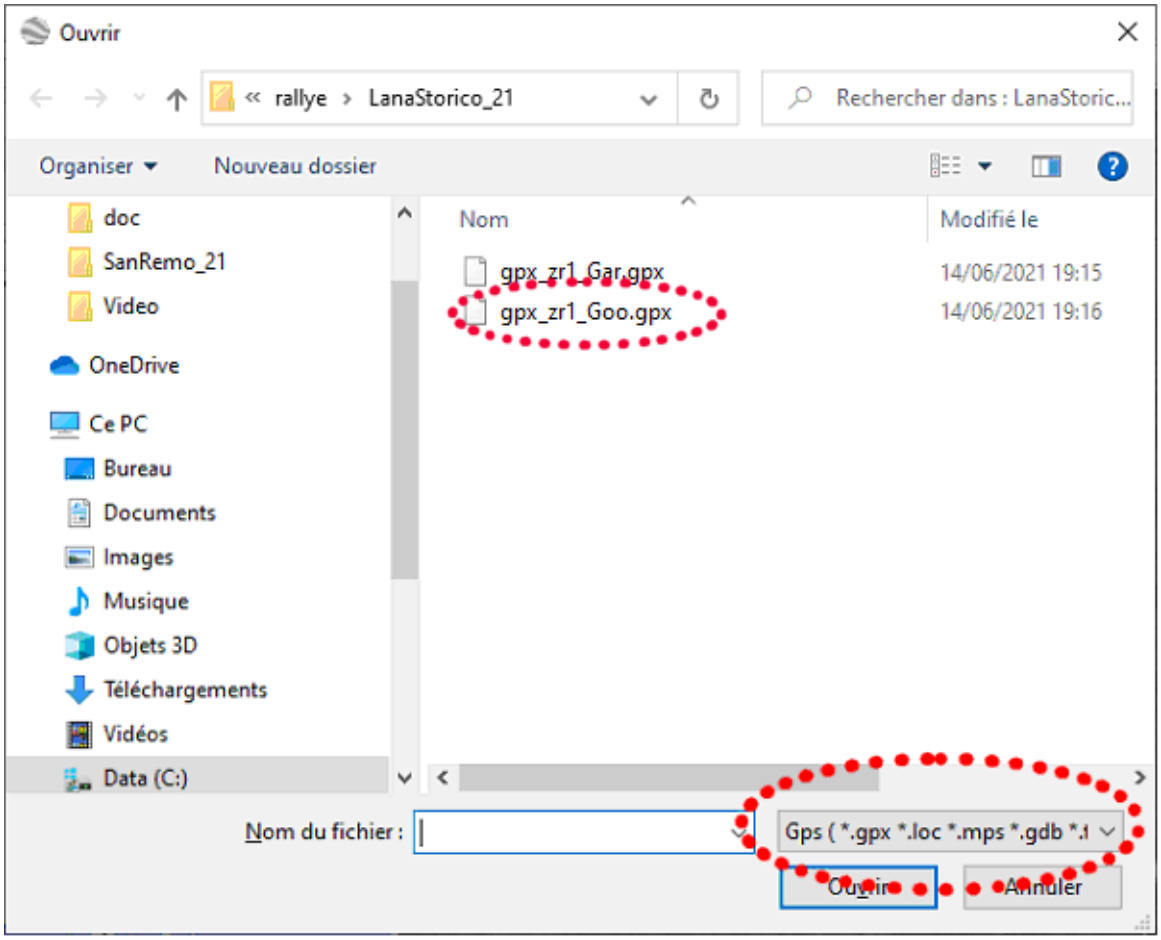
Once the start is made, it is important to keep the trajectory "well to the right", i.e. not to cut any bend before the first GPS correction point, as this first correction is important. If it is greater than 3 m, the system will use it to correct itself and display an information message on the screen.

11 Working with the GPS correction files

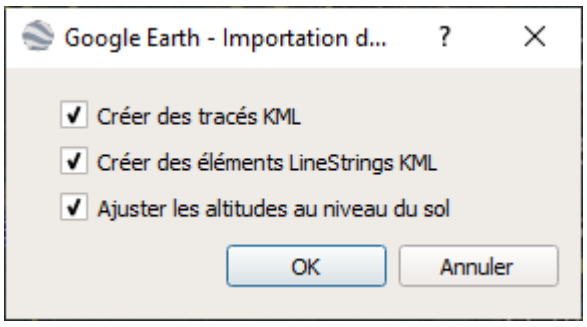
To process the correction files, start by viewing the position of the waypoints, in *Google Earth* for example. The files are generated automatically and systematically when the files are extracted from the device (middle button in the page that opens when a USB key is inserted).

Files ending with **_Gar** are more likely to be opened with *Garmin Basecamp*, while those ending with **_Goo** are more likely to be opened with *Google Earth*.

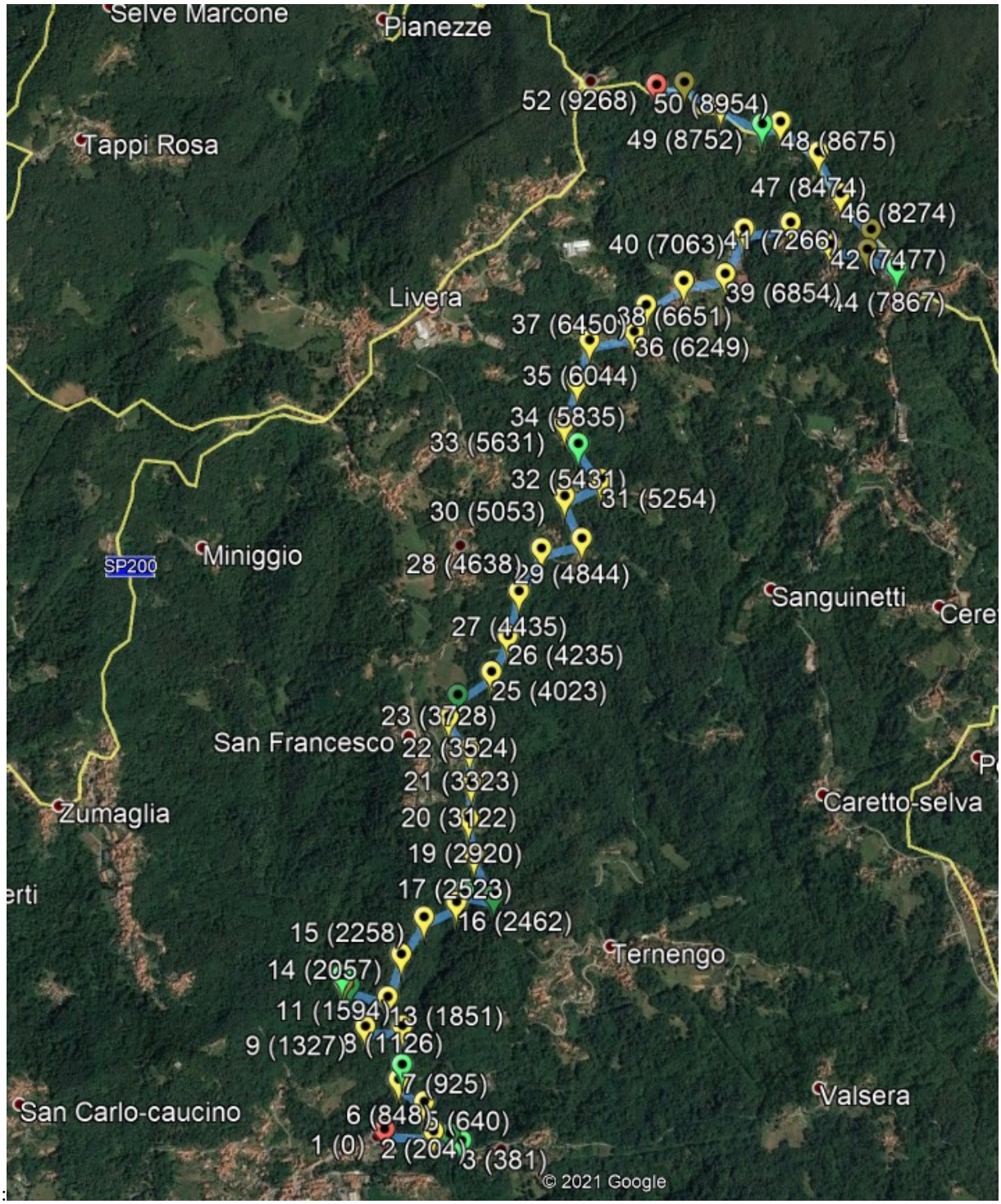
In *Google Earth*, menu **File-Open**, then select the GPS files at the bottom:



and tick all the boxes:



This results in a map that looks like



If you zoom in, you can see:

:

You can then open the corresponding file (gps_zr2.csv) with a spreadsheet program (*Excel, LibreOffice, OpenOffice*...), or a text editor (*Notepad*...):

67	a	11966	45.6654425	8.22389366
68	a	12167	45.6670955	8.22370116
69	a	12367	45.6676901	8.22154416
70	a	12570	45.6689655	8.22186
71	a	12777	45.6704288	8.22098866
72	a	12983	45.6711563	8.2207085
73	A	13130	45.6699226	8.220519
74				

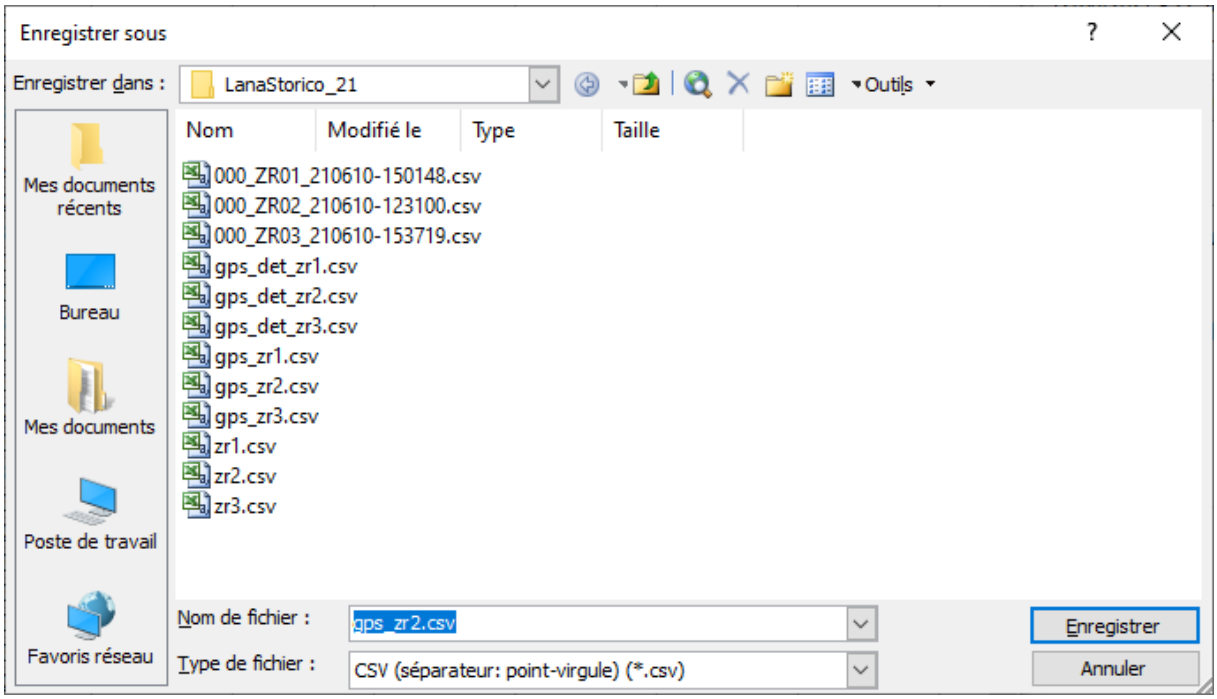
gps_zr2

Prêt

It is possible to work easily on distances. It is also possible to work on coordinates but it is much more complicated.

Note: it is now possible to perform normalisations on the device at the end of recognitions, see *§4.3.3 Normalization on the device, at the end of RT*.

Caution: **when saving the file, make sure to keep the CSV format, semicolon separator (bottom selector):**



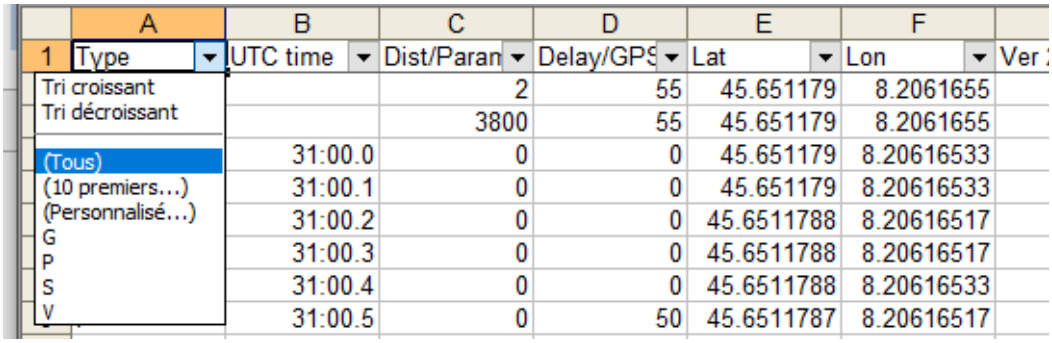
12 Checking the GPS corrections

If a test run (in a car) is made by simulating the race (with the stopwatch), the device records the readings. We will then be able to check these corrections.
Open the file corresponding to the RT2 (here 000_ZR02_210610-123100.csv). See the characteristics of the file in the general manual § Records.

Advice with *Excel*:

- select the second line, then "Window - freeze panes" menu,
- return to the first box and then the "Data - Filter - Automatic filter" menu.

It is then possible to filter the data by column. For example the data types:



Here we see that there is no 'W' data line, so there is no missed point.

If you click on 'G', you will only see the corrections:

	A	B	C	D	E	F	
1	Type	UTC time	Dist/Paran	Delay/GPS	Lat	Lon	Ver 2
236	G	2	5	68	45.6512562	8.20820483	
402	G	3	6	63	45.652392	8.20965183	
582	G	4	-10	66	45.6528	8.21135017	
782	G	5	1	68	45.653547	8.21345383	
859	G	6	1	68	45.653249	8.2143635	
1050	G	7	1	42	45.6526402	8.21636717	
1239	G	8	-1	52	45.651226	8.21508483	
1435	G	9	1	53	45.6497305	8.21483383	
1626	G	10	-2	56	45.6481015	8.2148795	
1707	G	11	2	56	45.6472857	8.21498817	
1865	G	12	-6	48	45.645607	8.21424517	
2025	G	13	2	66	45.6442002	8.215506	
2169	G	14	0	63	45.6430852	8.21749533	
2330	G	15	-1	65	45.6420047	8.21943367	
2505	G	16	3	67	45.6417468	8.219616	
2639	G	17	-2	68	45.6413495	8.2192495	
2841	G	18	-1	68	45.6411408	8.22131067	
3048	G	19	0	58	45.6423125	8.22238983	
3223	G	20	2	61	45.6418987	8.22479767	
3421	G	21	-3	68	45.6402395	8.225696	
3502	G	22	1	63	45.639602	8.22636167	
3709	G	23	0	68	45.638425	8.22775133	
3905	G	24	0	68	45.637705	8.22927333	
4086	G	25	3	56	45.637216	8.22858617	
4288	G	26	-2	52	45.6370075	8.2272535	
4339	G	27	-1	56	45.6367702	8.22798333	
4495	G	28	9	57	45.6358565	8.22981183	
4644	G	29	-8	53	45.6342075	8.23086467	
4842	G	30	-1	62	45.6329818	8.23203683	
4882	G	31	0	62	45.6328477	8.23256133	
5094	G	32	13	41	45.6320582	8.23476767	
5281	G	33	-9	37	45.6310257	8.23655533	
5471	G	34	-5	55	45.6309915	8.23700217	
5663	G	35	3	23	45.632597	8.23682317	
5815	G	36	7	32	45.6341407	8.23808783	
6038	G	37	-9	59	45.6341335	8.23705567	

In 'B' column, we have the index of the waypoint and in 'C' column the correction. If we think that waypoint 32 should be deleted, we go back to the 'gps_zr2.csv' file to delete line 32.

Caution: for all line deletions, start at the end, to prevent the lines from shifting!

Important: **once all these operations have been carried out, put the file back into the device to benefit from the fine verification of the files**, see §7. This will detect the slightest error in the file format or otherwise.