RALLYMETER ULTRA

OWNER'S MANUAL

Regularity rally co-driver assistant

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Appendix A. Rallymeter Ultra hardware

1. Welcome to Rallymeter Ultra

Rallymeter Ultra is a precision co-driver assistant for regularity (average-speed) rallies. It combines a high-accuracy trip meter, a real-time pace computer, self-correcting reference waypoints, roadbook cross warnings, voice pace notes for bends and a spoken pace call — all designed to be operated with rally gloves on, at a glance, in a moving car.

The app runs on iPhone, iPad and Android using the phone's own GPS, and can be paired with the **Rallymeter Ultra** unit (the **Ultra GPS** high-rate receiver plus optional wheel sensors) or with the classic Rallymeter **blackBox** for the most precise distance measurement.

1.1 Core concepts

Event. A rally. Every stage belongs to one event (name and optional dates). The crew chooses the current event by hand; dates are informative only.

Stage. The basic unit of work. A stage has a name, a total distance, an optional start time, an optional start PK and one or more speed segments. It can additionally carry references, bends and roadbook crosses.

Speed segments ("averages"). The list of imposed average speeds. Each segment starts at a distance from the stage start ("From") and holds a target speed (km/h) until the next segment begins.

Delta (early / late). The heart of the display: the difference between where you are and where you should ideally be at this instant. Positive means early (advance), negative means late (delay). Shown in seconds or metres.

Reference waypoints ("refs"). Points on the road with a known stage distance. When the car passes one during the stage the odometer is corrected to it automatically. References are the truth of the stage: everything else is a measurement.

Roadbook crosses. Distance-triggered navigation warnings for junctions and traps ("at 1.500 there is a 90° right"), with three beeps as you approach. In a classic regularity rally, not getting lost is vital; crosses exist for that reason and take priority over everything else.

Bends. An optional list of corners obtained from the stage route. With bends, the stage screen adds spoken rally-style pace notes and a roadbook-style corner display on top of the regularity computer.

Link section. What comes after END OF STAGE: the road to the next time control. The odometer keeps running; the screen changes so it is clear you are no longer in a special stage.

1.2 Units and number format

All distances are **entered as plain metres** (type `12000`) and **displayed with a dot as thousands separator** (`12.000`). Speeds are in km/h; times are wall-clock HH:MM:SS. Read 12.000 as "twelve thousand metres", never as a decimal.

1.3 Distance sources, in one line each

- **Phone GPS** — always available, no hardware.
- **Ultra GPS** — the Rallymeter Ultra unit’s dedicated receiver: ten positions per second, four satellite networks, distance measured on board. Precision without touching the car.
- **Wheel sensors** — one or two pulse sensors on the Rallymeter Ultra unit, or the classic blackBox. Unaffected by tunnels or tree cover.

Crews with wheel pulses never mix wheel and GPS distance: one source drives the odometer at a time.

2. Getting started

2.1 First launch

The app opens on the **stage list** of the current event. On start it loads your calibrations and clock settings, reconnects to the last Rallymeter unit if *Auto-reconnect* is on (a green “Connected to …” or red “Could not connect …” message tells you the outcome), starts the pilot broadcast if *Pilot display* is on, and keeps the screen awake for as long as the app is in front.

2.2 The Settings menu

The same ⚙ settings menu is available everywhere — stage list and stage screen — with this order:

1. **Rallymeter Settings** — display, pace colours, pace voice, alerts, manual adjustment, end of stage, roadbook crosses, pilot display, calibration.
2. **GPS, Sensors & Calibration** — hardware connection, device type, distance source, calibration.
3. **Clock** — real time, atomic sync, organiser’s clock.
4. **Automatic References** — the global on/off switch and reference behaviour.
5. **Bends & Pace notes** — voice presets and everything about bend callouts.
6. **Import / Export** — backups.
7. **Pilot Settings** — how the driver’s screen looks.
8. **Pilot Mode** — turn *this* phone into the driver’s display.

During a stage some items are greyed out with the reason shown (“Not available during a stage”); Import/Export and Pilot Mode are among them. Changing the Clock during a stage is left to the crew.

2.3 Languages

The app, the voice and the pace words speak **English, Spanish, Catalan, French, German and Italian**. The language is chosen in *Bends & Pace notes*; every spoken word (left/right, grades, “zero”, “delay”, “advance”…) can be edited there.

3. Events and the stage list

3.1 Events

Tap the **event name in the title bar** (flag icon) to open the Events sheet. From there: **New event** (name, optional dates), **Edit event**, **Delete event**, **Export event** and **Import event** — an exported event carries its stages with bends, references and crosses, so a whole rally can be shared with another crew in one file. A stage can be moved to another event from its ⋮ menu (**Move to event**).

The current event is whichever you pick, regardless of dates. Stages without an event are added to the current one.

3.2 Carousel and list views

The stage list has two views, remembered between sessions:

- **Carousel** (default): one full-page card per stage. Swipe to change stage; chevrons and dots underneath (a counter "3 / 15" beyond 12 stages).
- **List**: compact rows with a big ▶ to start. **Long-press and drag** a row to reorder — this order *is* the running order of the event.

Each stage shows its distance, PK range when a start PK is set, ideal duration, start time, and a readiness row: references ("No refs", "37 refs", or "37 refs · OFF" when the global switch is off), crosses, and bends (with how many are switched off). The event's next stage carries a green **NEXT UP** badge: after you run a stage, the next one in the running order is selected for you.

If a stage has been run, the card shows **LAST RESULT** (or **LAST RUN · NOT COMPLETED** for an exited run) with the final delta in colour; tapping it opens its Historic.

3.3 The per-stage menu (⋮)

- **Edit Stage** — everything in chapter 4.
- **Bends** — *Import bends* (or *Import bends again*: replaces the current bends), *Edit bend notes*, *Delete all bends*, and the on/off state of each bend ("Off bends are not called").
- **References** — *Recon* (record references driving the stage), *Generate from route*, *Edit references* (distance and position of each one), *Delete all references*.
- **View Map** — available whenever the stage has bends **or** references.
- **Simulation** — drive the stage from the sofa (needs bends).
- **Historic** — the results and telemetry of this stage.
- **Duplicate**, **Move to event**, **Delete Stage**.

4. Creating a stage

Tap the **+** in the title bar. Numbers are typed on the big-button keypad.

- **Stage name** (required) and **Notes** (optional, shown on the card in amber).
- **TOTAL DISTANCE** — the official stage length, in metres.
- **START PK** — only for rallies whose stages do not start at zero (e.g. a stage running 15.000 → 18.000). The start PK is a display offset: the odometer, references and every calculation still run from zero, but the screen, the crosses and the result show the roadbook kilometre. **End PK** is shown for checking.
- **START TIME** — HHMMSS. Many crews never enter it and start manually; see 7.2.
- **SPEED SEGMENTS** — rows of *From* (PK) and *Speed* (km/h). *Add segment* appends a row; the stage preview shows the **ideal duration** and the **expected finish** time.
- **ROADBOOK CROSSES** — *Add cross*: the **Cross PK**, a **sign** from the standard set (Left 90°, Right 90°, Sharp/Slight left/right, Straight on, Crossroads, Fork left/right, T-junction, U-turn, Roundabout, Danger, Stop / control, or no sign), an optional note (“hidden cross behind crest — keep right”), and optional **coordinates** — typed, or captured from the current GPS position when you are standing at the cross.

A link between two timed sections, with its own timing, is entered as a separate stage placed before the next special stage in the running order.

5. References

5.1 Why references matter

Every odometer accumulates error — wheels, calibration, slip, GPS drift. References bring the error back to zero at every known point, so a crew with good references races on the organiser's distances rather than on its own measurement. The system handles references as close as **50 m apart**.

Capture them carefully: at low speed, on the driving line. In the race the car takes whatever line it can; the references are what keeps the odometer honest.

There are two ways to get them. Both fill the same list and can be mixed.

5.2 Recon Mode

Open ⋮ → **References** → **Recon** and drive the stage.

- **GPS quality bar**: GOOD (green), WEAK (orange) or POOR (red) against the *Min GPS accuracy* threshold, with the current ±m.
- The large **DISTANCE** readout (as PK) and the current speed.
- **START / PAUSE** — distance is only accumulated while running; a paused stretch is not counted.
- **Automatic capture** every *Auto-capture interval* (default 100 m). A capture is skipped, with a red notice, when the GPS is worse than *Min GPS accuracy* (default 15 m).
- **WAYPOINT** — a manual reference, always captured, for landmarks and the organiser's intermediate controls. Click plus a double haptic confirm it.
- The list of recent captures (manual = blue pin, auto = green dot) with per-item delete.
- **SAVE** writes the references to the stage. Closing with unsaved captures asks "Discard references?" (KEEP / DISCARD).

Recon measures with the same GPS-based odometer the stage screen uses when GPS is the source, so a recon and the run that follows measure the road the same way. Ultra GPS makes recon references noticeably sharper. Running Recon again appends to the existing list; use *Delete all references* first to start over.

5.3 Generate references from the route

Open ⋮ → **References** → **Generate from route**. No recce needed: the **Rallymeter Route Engine** builds the references from the organiser's route.

1. **Import Route** — paste a Google Maps link (long or short), or open a GPX/KML file. A references **CSV exported earlier from the app** can be opened here too: it restores the references exactly as exported, nothing is generated. While the engine works you will see its phases go by (*Linking to Rallymeter route service, Initialising RefSync™ core, Running distance model…*); it takes a few seconds.
2. **Calibration** — by default the references take the **length of the route**. Switch **Use official distance** on and type the organiser's total only when you have it; it is never pre-filled.

3. **Intermediate checkpoints (recommended)** — the organiser's intermediate controls, each with its PK and position (typed or picked on the map). With checkpoints, RefSync™ fits the references sector by sector so every control lands exactly on its official distance. Generating without any checkpoint shows a reminder: without them the references are only as good as the map route. A checkpoint must lie beyond the stage start.
4. **Generate** — set the **interval** between references and the **minimum spacing** (also applied without calibration); preview them on the map; **save**. If the stage already had generated references you are asked before they are replaced; manual references are kept.

5.4 Editing references

⋮ → **References** → **Edit references** lists every reference with its PK, position, accuracy and type (manual / automatic). You can:

- **Edit** a reference's distance or coordinates — through a confirmation dialog, so you know what you are changing. Correcting a manual reference recalculates the automatic ones around it.
- **Add** a manual reference by hand from the organiser's roadbook (PK plus coordinates) — the crew is not at the stage when this is done.
- **Delete** one, or **Delete all**.
- **Export CSV** to check them in Excel or Google Sheets and share with the team; the same CSV imports back through *Generate from route → Import*.
- **View Map** to see them on the route.

5.5 Automatic References settings

Settings → Automatic References holds the **global switch**: when it is off, references stay stored but are not used, the stage card shows "refs · OFF", and the REFS bar on the stage screen reflects it. The switch can also be flipped by **tapping the REFS bar** during a stage and from the start screen.

- **Recon capture**: **Auto-capture interval** (default 100 m) and **Min. GPS accuracy to capture** (default 15 m).
- **During the stage**: **Use references** (the global switch), **GPS accuracy limit** — a fix worse than this (default 30 m) is never used to correct the odometer: on a tunnel exit or in a canyon, no correction is better than a bad one — and **Match with Ultra GPS**.
- **Sound on each reference** — on/off, with the **Tick length** selectable as **1 / 2 / 3** (long to short; default 1) and a test play.

6. Bends and voice

6.1 Importing bends

⋮ → **Bends** → **Import bends**: paste a Google Maps link or open a GPX/KML. The Route Engine's **BendSense™** analyses the route and returns the bends graded by severity, with their shape (long, tightens, opens) and the road itself, so the stage screen can measure the distance to each bend along the road rather than as the crow flies. A preview lists what was found before you confirm. Importing again replaces the current bends.

6.2 Bend notes and switching bends off

⋮ → **Bends** → **Edit bend notes** lets you add a short note read together with the bend ("don't cut", "slippery") and switch individual bends **off**. Off bends are neither called nor shown; the stage card counts them. A stage whose bends are all off behaves as a stage without bends.

6.3 Voice presets

Settings → Bends & Pace notes starts with four presets — **Touring**, **Regularity**, **Regularity Sport** and **Rally** — tuned from flat touring to a hillclimb regularity at 60–70 km/h average. Pick one, adjust anything, and **Save as preset** to keep your own; custom presets can be renamed and deleted.

The main parameters, all with step buttons:

- **Enable Voice**, **Volume**, **Speech Rate** and **Fast Speech Rate** — the voice speaks at the normal rate and only accelerates when a note would otherwise not fit before the bend; accelerated notes are confusing, so this is kept to the minimum.
- **Lead Time** — the notes are timed in seconds from your real speed, not from a fixed distance, so at 40 or 90 km/h they arrive when they should. **Announce Distance** adds "in 200 metres".
- **Grouping Time** — bends close together become one note: "left 3 plus right 4". When several bends must fit in one call, wide (grade 1) bends are left out.
- **Sequential notes (beta)** — an alternative mode in which every bend is called once and calls are never cut. Opt-in.
- **Danger Threshold**, **Danger Bonus Time**, **Repeat Warnings**, **Repeat Lead Time**, **Pitch Variation**, **Alert Tones** (haptic before dangerous bends).
- **Severity Scale** (6, 9 or 12 levels), **Invert Scale** (ascending or descending numbering), **Minimum Angle**, **Minimum Severity**, **Second Bend Threshold**, **Long Curve Distance**.
- **Show Roadbook** — the visual bend icons on the stage screen. **Imperial Units**.
- The words themselves — left/right, grades, "zero", "delay", "advance" — are editable per language.

In Rallymeter (regularity) mode the bend reading on screen is drawn a little smaller than in Apex Notes: the voice does the talking and the timing data needs the room.

6.4 Rehearse at home: the simulator

⋮ → **Simulation** drives the stage without leaving the house, calling the bends and showing the roadbook, so voice settings can be tuned before the rally. Speed model **Constant** or **Regularity** — set to 50 it holds a 50 km/h average over the whole stage, slower in bends and recovering on the straights, like a real run. **Show pace notes / Show map** toggle the view; the map can be north-up or heading-up. The roadbook and the voice can be toggled during the simulation.

7. Running a stage

7.1 The pre-start card

START STAGE on the card opens the stage screen in pre-start: stage name, total distance (tap **DISTANCE** to change it: the last segment is stretched or shortened so earlier *From* points stay untouched), the start time, the live clock and the **START** button. The status icons in the top bar show the sensor link, GPS, references and pilot state; the pace voice and the bend voice have their own toggles there.

If the app was closed during a run, the first thing you see is **RESUME RUN**: when the run started, the distance at the last save, and a note that distance driven while the app was closed is not counted — correct it with Adjust distance or at the next reference. **DISCARD** starts fresh.

7.2 Clock and autostart

The **Clock** screen shows the phone's time, the **atomic (internet) time** and the offset between them, and lets you **SYNC ATOMIC AGAIN**. For rallies run on the organiser's own clock, **SET TO THE ORGANISER'S CLOCK**: choose the time their clock is about to show, keep the button pressed and let go exactly when their clock shows it; a **FINE ADJUSTMENT** row trims it, and **BACK TO REAL TIME** restores it. An optional **tick** sounds every second; the last seconds before a minute are marked.

With a start time entered, the stage starts **by itself at the exact second**: a full-screen countdown with spoken milestones (45, 30, 15 seconds, then 5-4-3-2-1 and *Go*), a start beep and a strong haptic. The start time can be nudged **±30 s / ±1 min** before the start, or retyped (HHMM or HHMMSS). If the official start has already passed when you arm it, the stage starts now, back-dated to the official time, and tells you by how much you are late.

Most crews on a real rally do not know start times in advance: press **START** at the marshal's signal, or type the time at the last minute. The clock is locked while counting down or running so a re-sync cannot shift a stage underneath you.

7.3 The running screen

The most important information is the **odometer and the averages**, and they get the room: a big PK readout (the adjusted distance), the current average and the next one with the distance to it, the ideal distance, the clock and the elapsed time. The **delta** sits in a coloured panel: **green** inside tolerance, **blue** early beyond the advance tolerance, **red** late beyond the delay tolerance (Rallymeter Settings → Pace Colours; default 50 m each). Seconds or metres is a setting.

- The **REFS bar** shows the next reference, how many are passed (`REF 12/37`), the last automatic correction, and flashes on each match. Tap it to switch automatic references on or off. "GPS poor" appears when the fix is too poor to match.
- With bends, the **side list** shows what is coming and the **roadbook icon** the next bend; a stage without bends shows no bend information at all.
- In landscape the layout uses the width: three columns, bigger odometer and averages.
- **Large display mode** (Rallymeter Settings) gives extra-large numbers.

- A small **NO GPS SIGNAL** note appears in a tunnel or under heavy trees when GPS is the distance source; it is not a fault. For a short gap the odometer keeps estimating at the last speed (“NO GPS SIGNAL — ESTIMATING”).
- A **link banner** appears only when the Rallymeter unit really disconnects: the app reconnects on its own and runs on the phone GPS meanwhile; when the unit is back, what it counted during the gap replaces the fallback distance, so nothing is lost or counted twice. The banner can be dismissed for that outage.

The adjust bar

The **MANUAL / REF ADJ** readout shows the metres you added by hand and the metres the references corrected. **–** and **+** adjust the odometer by the *Adjustment step per tap* (default 5 m); the opposite tap is the undo. **Tap the readout** to enlarge the whole adjust section, buttons included — it stays enlarged until you tap again.

Manual adjustments **always prevail**: a reference correction never overrides or clears what you adjusted by hand.

The central stage menu

Tap the delta panel to open five glove-sized buttons (they act on release), plus CLOSE:

- **RE-SYNC** — the emergency “find me” button. It searches the whole stage for the bend after the car’s position, however far from the road you are, and arms the references so that the first one you really pass sets the odometer, whatever it reads. The odometer never moves until a reference is physically passed. A message summarises what was done (“bend #12/48 · refs: the next one passed sets the odometer”).
- **ADJUST DISTANCE** — the *SET DISTANCE TO* keypad, with ±10 / ±100 presets. Has an UNDO for 10 s.
- **CALIBRATION** — shows the calibration in use (sensor or GPS) and opens the calibration screen. A change applies from that moment on; distance already travelled is not recalculated.
- **EDIT STAGE** — the live segments editor, for last-minute changes by the organiser.
- **REVERSE MODE / END REVERSE** — incoming distance subtracts from the odometer while you drive back to a missed cross. A pulsing red banner stays on screen until you end it.

7.4 References in the race

Pass a reference and the odometer is corrected to it, with a tick (length 1/2/3) and a flash of the REFS bar. Small corrections are smoothed when references are close together; when consecutive references agree the correction is applied in full. A reference that was missed never blocks the ones after it, and a wrong match is rejected. The counter advances through the list, so references 50 m apart are each used, at any speed.

7.5 Roadbook crosses in the race

Crosses come first. At the *Popup warning distance* (default 200 m) the cross **popup** appears with its sign, note and distance, with its own beep (switchable). Then the three classic beeps: a **single** beep at the *First beep distance* (default 100 m), a **double** beep at the *Second beep distance* (default 50 m), and a **long** beep on passing the cross. While a cross is active the bend voice and the pace voice

stay silent. The popup's **ADJUST** button sets the odometer to the cross PK as you pass it (UNDO for 10 s); **DISMISS** closes it, and *Auto-hide after passing* closes the popup by itself.

7.6 Pace voice: the "zero" call

The co-driver's classic call, so the driver never has to look at the screen. With *Pace voice* on (Rallymeter Settings → Pace Voice; also a toggle in the stage top bar), the app says:

- **"zero"** while you are within the **zero band** (default ±3 m), repeated every *Repeat* interval (default 10 s) so the driver knows the pace is held;
- **"delay 4" … "delay 3" … "zero"** or **"advance 7"** while you are a little off — **every change is called at once**, as soon as the voice is free, so the driver hears the correction working, step by step;
- beyond the colour tolerances, the situation ("delay 25") on entering and then on the repeat cadence — a big delay is a long recovery and the driver is already pushing; a **growing advance**, on the other hand, is called on every further metre at once, because the driver only has to brake.

Calls are never queued: what is said is always the live value. Audio priority is strict — roadbook crosses first, then bend calls, then pace. A bend tighter than *Quiet before bends tighter than* (default: grade 3 and up) silences the pace voice from its call until the bend is passed; wider bends just take turns. The settings: **Zero band** (1–5 m presets), **Minimum gap between calls** (default 0.5 s — keep it short), **Repeat unchanged value** (off, 5, 10, 20 s), the mute grade, and a **Test** that plays "zero", "delay 4", "advance 7", "delay 25". The words are translated in all six languages and editable like the bend words.

7.7 END OF STAGE and the result

From the *END OF STAGE button distance* before the finish (default 200 m) a large **END OF STAGE** button appears. It acts on release, **with no confirmation**, and offers **UNDO for 10 seconds** — the run keeps going underneath during that window, so nothing is lost if you pressed early.

Then the **STAGE RESULT** screen: start, finish, time and ideal time, PK range, stage distance against the odometer with the **difference in metres and percent**, average and target speeds, the measured distance, the corrections (reference and manual), the calibration used and the references matched. It is a record for later consultation: there are no buttons, it closes on a tap anywhere, it is stored in Historic, and with *Save result screenshot* on it is also saved to the camera roll.

7.8 The link section

The stage does not really end at END OF STAGE. The odometer keeps running on the link to the next time control, on a screen that looks deliberately different — **LINK SECTION** banner, blue frame — with: the distance covered since the stage end, the **NEXT STAGE** (its start time and name, from the event's running order) with a countdown, and, once you **SET LINK DISTANCE** from the roadbook, an estimate of how **EARLY** or **LATE** you will be at the next start. The odometer only stops when you leave the stage.

7.9 Leaving a stage

The back arrow during a run asks “Exit stage?” with big **CONTINUE / EXIT** buttons. Exiting keeps the telemetry captured up to that point; the run is listed in Historic as **NOT COMPLETED**, with no end-of-stage result but with everything that happened until the exit. Leaving a countdown just cancels it.

8. Pilot mode

A second phone in front of the driver mirrors the co-driver's screen over Bluetooth, with no accounts or pairing.

1. **Co-driver's phone**: Rallymeter Settings → *Pilot display (second phone)* on. The broadcast starts immediately and stays on for the whole session.
2. **Driver's phone**: Settings → **Pilot Mode**, then **CONNECT**. It remembers the co-driver's phone; *Forget co-pilot phone* is in Pilot Settings.

The pilot screen is built for a driver with no time to look: the **delay/advance colour fills almost the whole screen** — fading in before the tolerance and full at twice it — with the delta, distance, speed and averages in large type. The bend card and bend list appear only when the stage has bends. It shows **WAITING FOR START**, the **STARTING IN** countdown, the running values, and keeps showing them after END OF STAGE while the co-driver reads the result. The **LINK SECTION** is clearly marked. Clock, countdown and distance are interpolated on the driver's phone so nothing freezes if a packet drops; if the link really stops, the screen greys out with **SIGNAL LOST** — a driver must never launch off a frozen countdown. The pilot phone is read-only.

Pilot Settings — *Screen colour strength* (Low, Medium, Full) and *Forget co-pilot phone*.

9. Sensors, Ultra GPS and calibration

9.1 Connecting a Rallymeter unit

Settings → GPS, Sensors & Calibration. The **CONNECTION** panel scans and lists nearby units with signal strength; **Connect** on one of them. *Auto-reconnect to last device* reconnects in the background on every app start; *Forget saved device* clears it. The Bluetooth icon in the stage top bar shows the live state.

The app **recognises Rallymeter units by name**: when a classic blackBox, a Rallymeter Ultra or a Rallymeter Ultra + GPS connects and the configured device type does not match, a dialog proposes to **Switch** (or **Keep**); a declined proposal is not asked again until the next connection.

Device type: *Rallymeter BlackBox (classic)*, *Rallymeter Ultra + GPS* (also for an Ultra unit without GPS), *Generic – 1 sensor*, *Generic – 2 sensors*, or *Custom / Manual* (byte offsets, counter width, rollover, for other Bluetooth odometers). The classic blackBox keeps its old configuration and is read correctly, glitches included.

9.2 Which source drives the odometer

- **SENSOR USED FOR DISTANCE**: *Bluetooth* (wheel pulses, when a unit is connected) or *GPS* (Ultra GPS when available, else the phone).
- **DISTANCE SOURCE** with a unit: *Sensor 1 only*, *Sensor 2 only*, *Average of sensor 1 + 2*, or *Ultra GPS* distance. *Enable second sensor* for redundancy or averaging.
- **Navigate with Ultra GPS**: reference waypoints, crosses and bends use the Ultra GPS position instead of the phone's. If the fix is lost the app falls back to the phone GPS with a warning and returns to the unit by itself.
- The live **Ultra GPS panel** shows the fix type, satellites, position, speed, accuracy and distance; while waiting for a fix the stage screen shows **SATS / RAW FIX / LAST PKT** pills, and a red warning if no GPS packets have ever arrived.

Link loss and GPS loss are two different things. A unit that disconnects is a fault: the app reconnects, runs on the phone GPS meanwhile and tells you. A GPS fix lost under trees with the link alive is normal driving: wheel pulses keep counting and you never see a disconnection advice.

9.3 Two calibrations

Rallymeter Ultra keeps **two separate calibrations**, each with its own history:

- **Sensor calibration** — metres per pulse of the blackBox or wheel sensor.
- **GPS calibration** — a multiplier on GPS distance (phone or Ultra GPS); 1.00000 = no correction.

Each is shown to **5 decimals** and can be typed by hand (within a sane range), picked again from the **history** (every value has its date and a **notes** field — "Michelin 15", "wet, Sóller"), or set with a **calibration trip**: *NEW TRIP*, drive a stretch of known length — the organiser's road stage, a measured kilometre — with the wheel sensor, the Ultra GPS or the phone GPS, *FINISH*, type the **official distance** and **USE THIS CALIBRATION**. The trip can be abandoned at any time; a trip too short to calibrate is refused.

The calibration in use is the one matching the current distance source. It can be changed **during a stage** from the central menu and applies from that moment on.

9.4 Signal inspector

The **SIGNAL INSPECTOR** (collapsed by default) shows the raw packets, both counters, packet rate and link age, for diagnosing wiring or a custom packet format.

10. Telemetry and Historic

Every run records the stage situation **once a second**: odometer, ideal distance, delta in seconds and metres, speed, target speed, measured distance, reference and manual corrections, distance source, position and GPS accuracy, plus the events (references matched, adjustments, crosses, END OF STAGE…).

Historic (per stage, or *Results of all stages, all events* from the Events sheet) lists the runs; a run that was exited is marked **NOT COMPLETED · EXITED** and keeps its telemetry up to the exit. Opening a run shows:

- the **result** header (difference, corrections, calibration);
- graphs of **TIME EARLY / LATE**, **DISTANCE GAINED / LOST**, **SPEED** and **DISTANCE CORRECTIONS**, **by distance** or **by time**;
- **MAX DELAY / MAX ADVANCE** and **AVG DELAY / AVG ADVANCE**, with the share of the time spent on each side;
- pinch sideways to zoom the window, pinch up and down to zoom a graph vertically; **FRAME** fits the vertical range to the window you are looking at; drag across a graph for the values at that point;
- **Export CSV** (`time_s, odometer_m, ideal_m, delta_s, delta_m, speed_kmh, target_kmh, measured_m, ref_correction_m, manual_correction_m, source, latitude, longitude, gps_accuracy_m`, plus an events table) and **Delete run**.

After a few stages, fine-tuning the calibration stops being guesswork.

11. Import, export and backups

Settings → Import / Export. **Export** writes a **Rallymeter Ultra backup** (`.rmbackup`) with the stages you select (all, none, or a pick), optionally including bends, references and roadbook crosses, plus the Rallymeter and navigation settings. It goes out through the share sheet to AirDrop, mail, the team chat or a cloud folder. **Import Backup** opens such a file and lets you choose what to take: stages (*Replace existing stages* overwrites stages with matching IDs), bends, references, crosses, settings.

Events export and import on their own from the Events sheet (chapter 3), references as CSV from the editor (chapter 5), telemetry as CSV from Historic (chapter 10).

12. Quick reference

12.1 Settings and defaults

Setting	Default
Pace display	seconds (or metres)
Advance tolerance (green → blue)	50 m
Delay tolerance (green → red)	50 m
Alert threshold / flash / vibrate	5 s · on · on
Next average speed beep	10 m before
Adjustment step per tap	5 m
END OF STAGE button distance	200 m
Save result screenshot	on
Cross popup distance / popup beep	200 m · on
Cross beeps: first / second	100 m · 50 m
Auto-hide cross after passing	off
Pace voice	on
Zero band	±3 m
Minimum gap between pace calls	0.5 s
Repeat unchanged value	10 s
Quiet before bends tighter than	grade 2 (grade 3+ silence the pace voice)
Automatic references	on
Auto-capture interval / Min GPS accuracy	100 m · 15 m
GPS accuracy limit (matching)	30 m
Reference tick	on · length 1
Auto-reconnect to last device	off
Second sensor / Navigate with Ultra GPS	on · on
Atomic clock	off
Pilot display	off

12.2 In-stage gestures

Where	What
Delta panel	Central menu: RE-SYNC · ADJUST DISTANCE · CALIBRATION · EDIT STAGE · REVERSE
REFS bar	Automatic references on/off
MANUAL / REF ADJ readout	Enlarge the adjust bar (persists)
Top-bar voice icons	Pace voice on/off · bend voice on/off · roadbook panel
END OF STAGE	Acts on release · UNDO 10 s
Result screen	Tap anywhere to close
Back arrow	CONTINUE / EXIT

12.3 Troubleshooting

- **The odometer does not move at the start.** Check which source is selected (Bluetooth vs GPS) and that the unit is connected; on GPS-only, wait for the fix (SATS pill).
- **“NO GPS SIGNAL” in the stage.** Normal under cover; the odometer estimates through short gaps. With wheel pulses the distance is unaffected.
- **Link banner.** The unit lost Bluetooth: the app reconnects and runs on the phone GPS meanwhile; the gap is reconciled when the unit returns.
- **References are not matching.** Check the global switch (REFS bar / “refs · OFF” on the card), the GPS accuracy, and that the references were captured on the driving line. RE-SYNC arms the next real pass.
- **Wrong device type proposal.** Keep or Switch; the app asks once per connection.
- **The pace voice is quiet.** A cross is active, a tight bend is being called, or the stage top-bar toggle is off.
- **Lost in the stage.** RE-SYNC, then drive to the next reference; the first one passed sets the odometer.
- **Time is off from the organiser’s.** Clock → set to the organiser’s clock before the stage; it is locked while running.

Appendix A. Rallymeter Ultra hardware

- **Unit**: Rallymeter Ultra, Bluetooth Low Energy to the app (iOS and Android), advertised as *RallymeterUltra+GPS* (or *RallymeterRS-Wheel* without GPS). Powered over USB.
- **Ultra GPS**: high-precision multi-constellation receiver — GPS, Galileo, GLONASS and BeiDou concurrently, **10 positions per second**, distance measured on board from satellite-measured speed (never from position jumps), short signal gaps bridged, automotive dynamic model.
- **Wheel sensors**: two inputs for reed or Hall pulse sensors (12 V automotive supply accepted), each counted independently; choose sensor 1, sensor 2, the average, or the Ultra GPS as distance source.
- **Status LED** on the unit; counters and GPS distance can be reset from the app.
- **Compatibility**: the classic Rallymeter blackBox and its sensors; other Bluetooth odometers (single or dual counter, or a custom packet format).