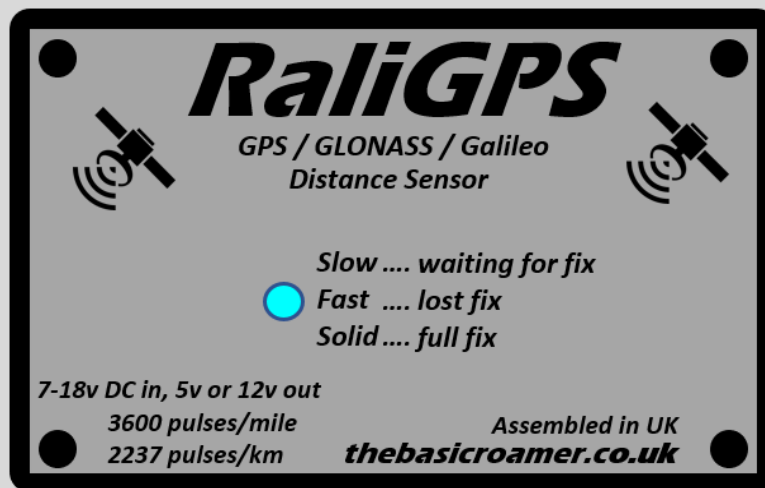


RaliGPS®

User Booklet

RaliGPS®

RaliGPS Distance Sensor



GPS



GLONASS



Galileo

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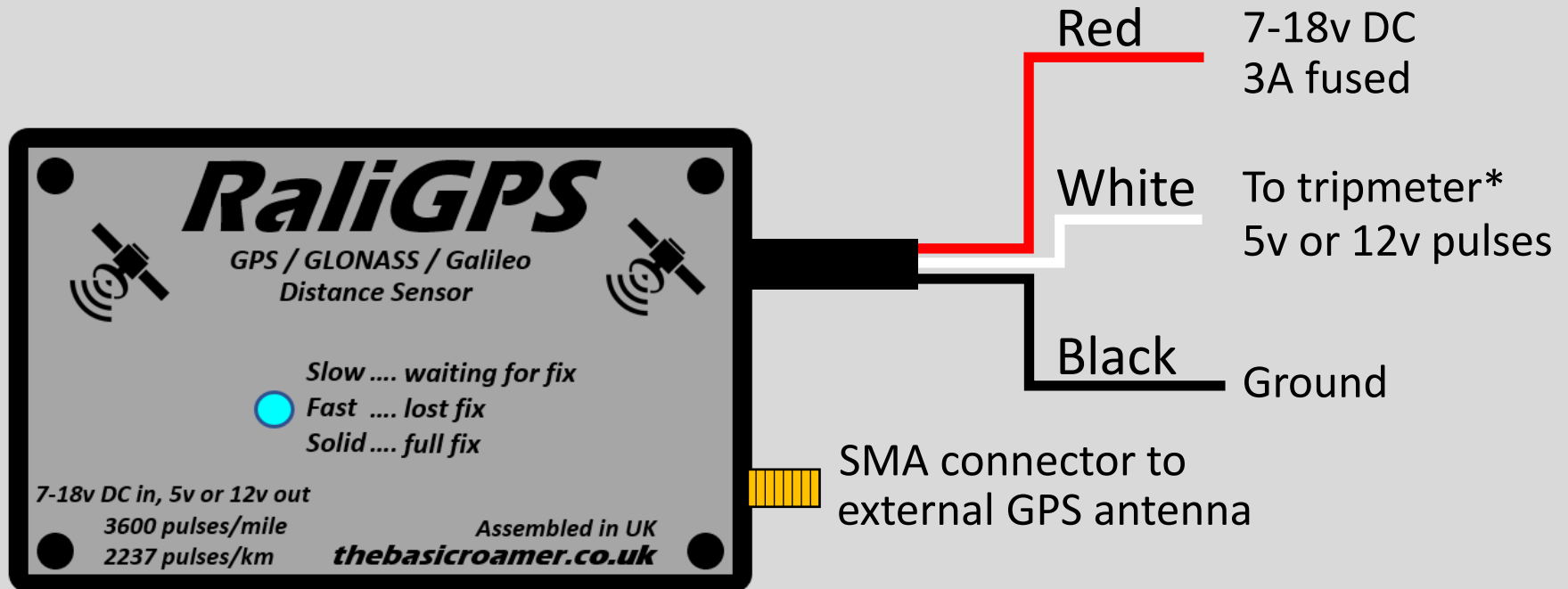
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Overview

- RaliGPS is a high accuracy unit that uses global navigation and positioning technology to produce pulses to drive tripmeters to accurately show distance travelled.
- RaliGPS has an internal GNSS sensor and antenna (detecting and using the American GPS, Russian GLONASS and European GALILEO global navigation satellite constellations simultaneously). For simplicity, the unit is called RaliGPS and “GPS” is used in the remainder of this booklet when describing RaliGPS and its features.
- RaliGPS is supplied with:
 - an external magnetic mount GPS antenna to maximise satellite detection/tracking and distance accuracy. This antenna has a 3 metre lead, but extension cables can be used to extend this
 - a (fixed) ~1.0 metre power/output lead which needs to be simply connected to the vehicle power (7-18 volts, positive or negative earth) via a user supplied 3A fused connection, and the tripmeter.
- RaliGPS is calibrated to produce 3600 pulses per mile travelled (or 2237 pulses per km travelled) and can be configured by the user, via switches inside it, to:
 - generate 5 or 12v pulses
 - determine how the unit recovers distance travelled if a fix is lost e.g. due to entering a tunnel or a densely wooded area.

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Connections



* please refer to your tripmeter instructions/manufacturer on how to connect a “pulse” (i.e. voltage producing) sensor to your tripmeter

How to Use

- RaliGPS should be wired as per the previous page, ensuring that the ground connections between RaliGPS and the tripmeter are common.
- Each time RaliGPS is powered on, there is an initial time to first fix (TTFF, the time taken to capture strong enough satellite signals to give an accurate 3D-fix) before pulses are produced. With the external antenna fitted and with a view of open sky, TTFF is normally between about 2 and 45 seconds. In extremely poor reception conditions, which are very rare, the TTFF can be longer.
- The longer RaliGPS has been powered off, the longer the TTFF. Short periods of power off (say up to a few minutes) should have a power on TTFF of just a few seconds.
- GPS fix status is indicated by the blue LED on the cover:
 - Awaiting first fix – LED flashes slowly
 - Fix obtained – LED is on
 - Fix is lost – LED flashes quickly.

Lost Fixes

- It is possible for RaliGPS to lose its fix when driving through very densely wooded areas, city centres with very tall surrounding buildings or long tunnels. It should be noted that RaliGPS will keep a good fix to the satellites in most wooded areas, even with trees covering the road completely, normal urban and city areas and short tunnels. A “lost fix” scenario can result in the attached tripmeter losing distance.
- In a lost fix scenario, the LED flashes rapidly and RaliGPS can be set to behave in one of three ways:
 - **Do Nothing** – pulses to the tripmeter will stop when the fix is lost and restart when the fix is regained
 - **Catch Up** – pulses to the tripmeter will stop when the fix is lost, but when the fix is regained, pulses will be sent to the tripmeter to make up for the missing “as the crow flies” (i.e. straight line) distance i.e. the tripmeter will “catch up”. The missing pulses are sent at the equivalent of ~300mph
 - **Fixed Speed** – pulses will continue to be sent to the tripmeter while the fix is lost, at a rate equivalent to vehicle speed at the point of the lost fix i.e. the tripmeter will appear to be in a “fixed speed” mode. When the fix is regained, either:
 - Additional pulses will be sent if the number of pulses sent during the lost fix period is short of the number of pulses that should have been sent for the “as the crow flies” lost fix distance
 - New pulses after the regained fix will be suppressed if the number of pulses sent during the lost fix period is in excess of the number of pulses that should have been sent for the “as the crow flies” lost fix distance.

Lost fixes – Do Nothing



Tripmeter reading

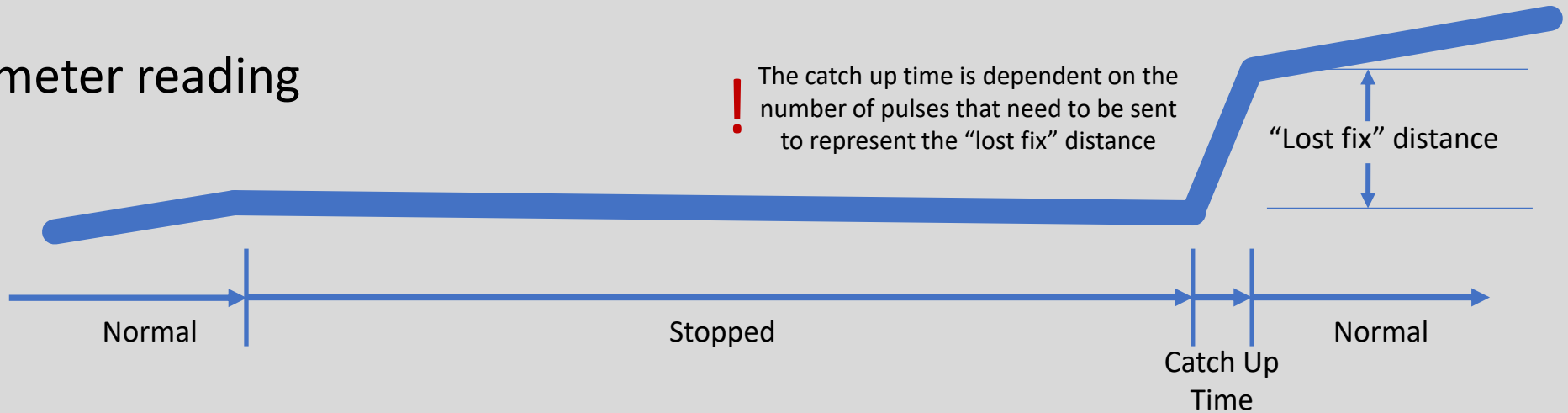
“Lost fix” distance
is missing



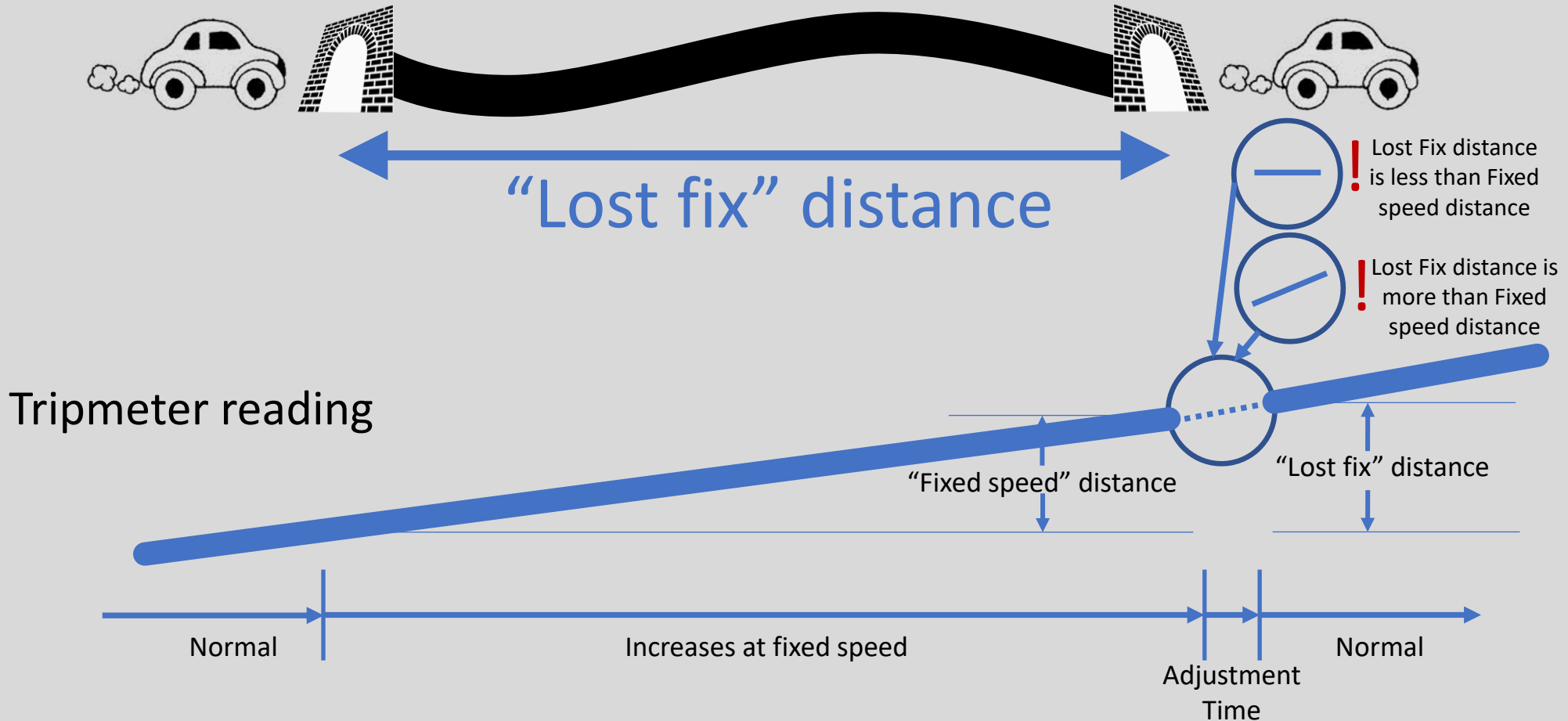
Lost fixes – Catch Up



Tripmeter reading



Lost fixes – Fixed Speed



! Adjustment time is usually small, especially if the lost fix distance is relatively straight and the lost fix speed is relatively constant

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Lost Fixes

Mode	Drawbacks	Advantages
Do Nothing	<ul style="list-style-type: none"> • Tripmeter does not increment during “lost fix” • “Lost distance” is permanently lost 	<ul style="list-style-type: none"> • Simple to use/understand
Catch Up	<ul style="list-style-type: none"> • Tripmeter does not increment during “lost fix” • The further the lost fix distance, the longer the Catchup Time before normal tripmeter operation is resumed • Some tripmeters may not process the catch up pulses arriving at an equivalent of ~300mph 	<ul style="list-style-type: none"> • Lost distance is accounted for
Fixed Speed	<ul style="list-style-type: none"> • Vehicle speed is assumed constant during the “lost fix”. If you slow down/stop/speed up the tripmeter will continue to increment (and/or show a constant speed) until the fix is regained • If you stop for a long time, or appreciably speed up/down during the “lost fix”, the Adjustment Time may be lengthy 	<ul style="list-style-type: none"> • Lost distance is accounted for • Tripmeter increments during “lost fix” • If the “lost fix” distance is relatively straight and your speed is relatively constant during the “lost fix” the Adjustment Time is minimal

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Options

- RaliGPS has two user selectable options:
 - **Pulse output voltage** – 5v or 12v (full 12v pulses available only if the power supply is ~13 volts or higher)
 - **Lost fix behaviour** – Do Nothing, Catch Up or Fixed Speed.
- Both options can be set by the user via slide switches inside the unit. The factory settings are **5v pulses** and **Fixed Speed** lost fix behaviour.
- To change either option:
 - Ensure the unit is entirely disconnected from the supply, earth, tripmeter and external antenna
 - Remove the four screws on the lid, and if fitted, the nut and washer on the SMA antenna connector
 - Gently lift the lid and **move it to the right, pivoting the lid on its right hand edge** (i.e next to the connectors)
 - As the lid rises, allow the external antenna connector to come out of the case and the lid to be completely removed from the case. Do not put any strain on the cable attached to the circuit board
 - Set the slide switches as required
 - Gently replace the lid using the reverse sequence, and refit the lid screws and nut and washer.

Frequent Questions

- **Is there a lowest speed at which RaliGPS produces pulses?** – yes, to avoid spurious pulses when at rest, the minimum vehicle speed before pulses are produced is 1.5mph/2.4kph
- **Does RaliGPS work indoors?** – you might be able to get a solid fix, depending on how many satellites the unit can “see”, although the TTFF can be several minutes or more.
- **Do I have to use the external antenna?** – No, but for shortest TTFF and best distance and lost fix accuracy the external antenna should be used. In some circumstances, without the external antenna attached, a solid fix may not be achievable
- **Where should I install RaliGPS?** – Just about anywhere in the vehicle, but away from sources of extreme electrical noise. If it is impossible to use the external antenna, install the unit in a position with the best possible 360° view of the sky and with the label pointing at the sky
- **Where should I place the external antenna?** – The best place is centre of a metal roof, then on any metallic area with a vertical view to the sky, then on any area with a vertical view to the sky
- **Can I extend the antenna cable?** – yes, you need to buy a pre-made GPS “SMA male to SMA female” extension cable. RaliGPS has been tested successfully with 2x 5metre extension cables (plus the 3m cable on the antenna)

Frequent Questions

- **What calibration should I set on my tripmeter?** – for distances in miles, set the tripmeter calibration to the equivalent of 3600 pulses per mile; for distances in km, set the tripmeter calibration to the equivalent of 2237 pulses per km
- **What do I do if my event has a “measured distance” for calibrating tripmeters?** – Calibrate your tripmeter following the normal “measured distance” calibration techniques. This may result in calibration values slightly different to the nominal 3600 per mi/2237 per km values, depending on the accuracy of the organiser’s measurements
- **Why can the TTF be always around, or longer than 45 seconds?** – Usually because the GPS signal is poor, with the solution being to ensure that the GPS antenna is being used and it has a clear 360° view of the sky. Less likely is that the internal CR2032 3v battery, that retains approximate satellite positions while RaliGPS is powered off, needs replacing – follow the disassembly instructions on the Options page and carefully insert a new battery
- **What is the current consumption?** – less than 0.1 amps



Notes



A series of horizontal dotted lines providing a template for handwritten notes.



Notes



A series of horizontal dotted lines for taking notes.

