

Fleetmanagement based on GPS



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1. Introduction

This off-line system is designed for vehicle operation recording in the most simple and cheapest, but still complex way. The experience says, that most vehicle operators do not need real time vehicle monitoring, but only have vehicle operation records downloaded from time to time. That is the main focus of the off-line unit.

The solution looks simple from the outside, but very advanced and complex from the inside. The operation results fully justify the system purchase investment.

The internal GPS receiver determines the vehicle's position when the ignition key is on. The accuracy is about 10 m. The positions are recorded into the mobile unit memory in the preset time or distance interval. This data is read from the detachable memory block to the PC. The user-friendly software matches the determined position data with the detailed database of your country (points of population and significant traffic points on a 1/50 000 scaled map). Each position is assigned to its local name. The basic data can be extended all over the world. These charts contain complete road systems of all countries and additionally street systems of all districts and larger cities can be purchased, too. Both detailed and brief journey records are easily generated. The refuelling can be entered from the fuel payment card electronic billing or can be entered manually. The monthly and annual vehicle operational booking can be done easily.

It is also possible to open communication protocols of the mobile unit. In such cases, the mobile units can be operated under other dispatch control centre SW applications and users can use mobile units with already existing systems or can combine them with SW applications.

2. System Principle

The internal GPS receiver determines the vehicles position when the ignition key is on. The accuracy is about 10 m. The travel points are recorded into the mobile unit memory in the dynamic controlled time or distance intervals.

This data is downloaded from the detachable memory block to the PC through a data adapter. The adapter is also used for mobile unit identification and record parameters setup.

The user-friendly software matches the determined position data with the geographic database of Europe. Each position is assigned to its local name and a vehicle operations log is generated.

Communication with the mobile unit may be also controlled by the SW module, which can be easily integrated into local or the customers own SW applications.

3. Certification and Documents

The mobile unit is certified by TÜV (e12, No. 020081). The certificate is valid for the whole EU.

4. Operation Environment

The mobile unit is designed to fulfil the most severe automotive application criteria. The brand components of industry parameters are applied.

The unit's mechanical resistance assures its long time operation life.
The operation temperature range is from -40°C to + 70°C.

5. Mobile Unit Concept

The mobile GPS unit consists of the part fixed to the vehicle (connected with the vehicle junction box) and the detachable data memory section with a control panel. The control panel serves for switching over between business and private journey modes and indicates the actual selected mode and GPS signal receipt status. A miniature active GPS antenna is shipped with each unit.

The data reading adapter serves as a PC interface. The recorded journey data can be downloaded. Unit identification and record parameters set up when the unit memory section is inserted.

5.1. CPU

The mobile unit is controlled with a 16 - bit Phillips processor.

5.2. GPS

The OEM GPS receiver is the Trimble model Lassen LP with 8 parallel channels. This GPS device is designed to navigate even in extremely bad receipt conditions such as in a city, in canyons or forests. This GPS receiver does not have any limitations compared to 12 channel receivers. The performed tests show better results than for 12-channels. The channel number is not the decisive factor anymore. The decisive factors today are the firmware's signal processing and the signal noise removing.

5.3. Memory

FLASH 8Mbit

RAM 8Mbit

The data stored in the unit FLASH 8Mbit memory is compressed in a special way, so that the memory can store about one year of data presuming a record interval of 20 seconds. The performed tests show the capacity of at least 30 000km in a 300m record interval including the supporting speed or driven distance data.

5.4. Antenna

The active 3V GPS antenna (47x40x12 mm) can be mounted hidden or on top of the vehicles instrument panel. Optional roof antennas can be used as well.

6. Mobile Unit Functions

The unit position record start time depends on the GPS receiver. The standard Trimble Lassen LP cold start time is about 50 seconds. Usually, the first position is acquired in a few seconds after the unit is switched on. The firmware solution assures that the maximum distance inaccuracy is from 1‰ in an open landscape to 1% in an urban environment.

The journey record is executed automatically, no driver action is requested. The position, time, speed and driven distance are determined each second by the GPS receiver and are stored in the temporary memory. Selected records are transferred into the permanent memory. The selection algorithm is dynamic - generally, the higher the vehicle speed, the longer the intervals between permanent memory records. Because the driven distance is taken from the temporary memory, the

record interval in the permanent memory does not have any influence on its accuracy.

Each removal of the memory block from the unit is recorded into the memory. This feature reports each such attempt of the driver to avoid journey registration. Moreover, each exceeding of the preset speed is recorded into the permanent memory as well and so speeding can be easily identified.

Journeys are recorded as private or business. This is selected and indicated on the unit control panel. Besides this, the control panel lights indicate that the unit is switched on and whether the GPS signal is sufficient for position determination or not.

The switch-over between the private and business trips may be blocked by the mobile unit set up. Individual unit identification, record parameters and speed limit can be set up, too.

7. Mobile Unit Peripheral Devices

A Dallas chip reader can be connected to the unit. In this case, drivers can enter their identifications by the means of their personal Dallas chips.

The Communication keyboard serves for entering driver identification or other notes of the journeys.

A Laptop or PDA with GIS software supporting GPS NMEA format input can be connected to the unit serial line. In this case, the actual position in the map is shown.



8. Technical data

Power supply	9 - 15 VDC
Interface	RS232C
Operating temperature	-40°C - 70°C
Position determination	GPS
Size	109 x 74 x 27 mm
Weight	0.2 kg

9. Full Pack - all you need to start

This contains the mobile unit, the software with the database of transport points and a general European map on CD ROM, a PC data reading adapter and a GPS antenna ready for the hidden mount. It is not necessary to purchase any other components for vehicle or computer installation and operation.

10. Mobile Unit Installation

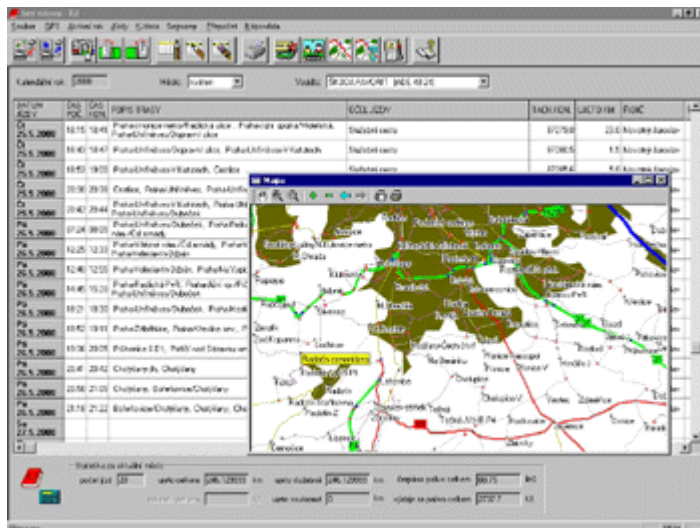
Mounting the device into the vehicle is very easy. In the standard version, the unit is connected only to the vehicle's electric power circuit which will be active when the ignition key is on. Thanks to their small dimensions, unit and standard GPS antennas can be easily located in the vehicle cabin or even be hidden.

Due to certification conditions and growing sensibility of today's vehicles electronic systems to unauthorised action, it is necessary to use the authorised car electronic service. In order to make the procedure safer, faster and cheaper we strongly recommend the brand service. The time of installation is usually shorter than 1 hour.

11. KONTROLLOR SW

This user friendly Windows 95/98/NT based SW allows to process the data from the Communication Server or the data imported directly from the mobile unit. The mobile unit is set up with the SW as well. The database of traffic points of the territory serves for vehicle traffic evaluation. The basic data contain your country on a 1/50 000 scale map and a general map of Europe. The basic data can be extended to the detailed maps of all the world's countries. The city street system plans are available for the districts and larger towns.

The pictures show the application "face". It is very easy to define any number of drivers or vehicles. The refuelling can be entered from the PC keyboard or can be imported from the fuel payment cards' billing. The authorised person can edit all the records with the help of functions such as frequent journeys preset and description. The recorded journeys can be depicted in the digital road map on a 1/50 000 scale.



12. SYSTEM BENEFITS - GPS JOURNEY LOG BENEFITS

12.1. Direct Expense Cuts

An average company car is driven 25.000 km per year with average consumption of 9 litres per 100 km. The average share of unauthorised journeys is both 20% in private and government sectors. Thanks to the positive effect of the system operation there will be the following direct expense cuts:

1. Fuel consumption cut of 450 l/year, i.e. about **450 EUR/year**.
2. Maintenance expense cuts (oil, tyres...) about **150 EUR/year**.
3. Fuel consumption drops 5% during authorised journeys (Thanks to a psychological effect - speed limits boost improvement. The research data and experience especially from the Netherlands confirm a consumption drop of a minimum 5% for most of vehicles). This saves about 100 litre per year, i.e. **100 EUR/year**.

Sub 1.	Sub 2.	Sub 3.	TOTAL
450	150	100	700 EUR

12.2. Consequent Expense Cuts

- Working time usage improvement – a minimum of 1 hour per day
- Automated fleet operation records processing may save several working places, depending on the current fleet.
- For proper manual vehicle operation records it is necessary to calculate 8 hours/month

Consequent expense cuts may significantly exceed direct ones. Pilot projects of big fleet operators show labour savings of up to 35 hours monthly. Labour productivity raise benefits depend on the hourly rate of the operator and is significantly higher than labour cost cuts.

Direct and consequent expense cuts show, that the GPS journey log return on investment is extremely short - even in the case that the operator is not intending to use it for repressive purposes.