

Telic Picotrack

The new ultra small and compact
GSM / GPRS / GPS Tracking and Tracing Device

“Always know what is happening”

User Manual



Version 1.3

June 2011

1 A Word in the Beginning

Thank you for your decision to purchase a Tracking and Tracing Module from Telic!

The Picotrack Tracking and Tracing Module is part of the Telic new product range. The Picotrack is a very innovative unit offering lots of tracking and monitoring options. The extremely small and unique form factor enables the user to use the Picotrack in new applications.

With your new Picotrack you can have the information anytime where the person, the vehicle or the asset under supervision actually is.

All information in this documentation has been carefully assembled and checked, but should not be considered as a guaranteed feature set.

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The Picotrack is ideally suited for the following fields of application:

Automated Vehicle Location – AVL

- Fleet-management
- Vehicle Leasing
- Taxi / public transport

In these applications the device is installed in the vehicle and will be permanently supplied by the vehicle's battery.

Person tracking

- VIP's
- Mental health patients
- Elderly people
- Children
- Animals (Dogs, Horses etc.)

In these applications, the Picotrack is carried on the body. The device has to be charged periodically. The device can be charged via USB cable connected to a USB charger or via PC.

Security tracking

- At dangerous jobs
- Vehicles
- Precious goods

In these applications the Picotrack is carried on the body, or is installed or concealed in a consignment of valuables. It has to be charged periodically, if it is not connected to the vehicle battery.

Asset tracking

- Containers
- Wagons
- Trailers
- Parcels

For these applications, the Picotrack is delivered in special housings with a larger battery or primary cell which ensures a very long operating life-time. If you are interested in such scenarios, please feel free to contact us so that we can make you a special project offer.

Event tracking

- Marathon races
- Paragliding
- Ski races
- Car races

Because of the multitude of possible application we cannot list them all. Therefore we will only refer to installation in vehicles or personal tracking applications.

Brands

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Oberhaching, 09 June, 2011
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2 Hints for this User Manual

This documentation has been written for users of the tracking and tracing Telic Picotrack module.

A significant number of people have been working on this document, in order to provide for you the best possible support and information while using the Picotrack.

Nevertheless if you find an error or if you have suggestions with respect to this documentation, then please send an email to

E-Mail: info@Telic.de

The intention of this documentation is to help you, using the various functions of the device in an optimised way. Please go through this user manual carefully.

In case you are in a hurry and you want to make yourself familiar with the details of this product at a later stage, then please go directly to Chapter 11 "Quick start".

There you can find all the relevant information, for getting the device into operation quickly.

The possibilities for use and configuration of the Picotrack described here are often dependent on the tracking platform used in conjunction with the Picotrack.

On request you can receive a manual from Telic on how to configure the most important parameters without having to have a tracking service subscription. (e.g. via SMS from your mobile phone).

3 Delivery Content

You can order the following Telic Picotrack variants:

- Telic Picotrack Standard (with 660 mAh battery) without any accessories (in this case choose all necessary parts individually using our parts list (see chapter 16)
Part number 06504
- Telic Picotrack Power (with 1300 mAh battery) without any accessories (in this case choose all necessary parts individually using our parts list (see chapter 16)
Part number 06506
- Telic Picotrack variants can also be ordered with an included power supply to charge with 230 V or via PC or notebook.



Additional accessories can be ordered separately (see chapter 17)

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5 Introduction

5.1 What is a remote surveillance module?

A remote surveillance module is the combination of a compact computer system with various interfaces, a GSM modem (mobile phone without a keypad or display), and a GPS receiver used to receive satellite-supported location information.

But, what does GPS mean?

GPS means "Global Positioning System". Originally, this satellite tracking system was developed by the U.S. Military for its own purposes.

A GPS receiver is able to determine its position on the earth's surface and its height above sea level to within a few meters. To accomplish this amazing feat, 24 satellites at a height of 20,183 km continuously cross our planet in six different patterns. They continuously send location data and time signals using an atomic clock.

GPS receivers simultaneously receive the signals of up to 12 satellites and compare the time of reception with their own built-in clock. Since the satellites operate at different distances from the receiver, the signal delay indicates the distance of the various satellites to the remote surveillance module. Using this difference, the GPS receiver is able to calculate its own position.

In order to transmit three dimensional results - length, height, width - the signals from at least four satellites are necessary.

Through the combination of the above technology, the device can perform surveillance and control tasks and transfer the results to a user via SMS or GPRS – and all this for a price far less than that of a laptop or a PDA with comparable functions.

Remote surveillance modules are available with or without satellite-supported positioning. With the Telic Picotrack unit you have made the choice to use a device with satellite-supported positioning. Therefore, aside from all of the surveillance possibilities of the device, you can also find its precise location and react to any changes in its position.

5.2 Operational Range

The Telic Picotrack unit is composed of two primary components: a GPS module and a GSM module.

The GPS module receives signals from the GPS satellites which are operated by the U.S. Department of Defense. These signals are available worldwide at every location. However, the precision of the positioning fluctuates. A thorough introduction to GPS can be found in Chapter 5.4, "Precision of the GPS-Position".

The GSM module is responsible for communication. It is a cellular module working at 850 MHz / 900 MHz / 1800 MHz / 1900 MHz. It functions properly anywhere in the world as long as GSM coverage is available.

Thus, you can use your Telic Picotrack device anywhere where you can receive network signals on your mobile phone. This means for you: You will be able to locate your vehicle pretty much anywhere in the world!

5.3 What does GPRS mean?

GPS and GPRS are two different things:

- GPS is a set of 24 satellites that send out positioning signals free of charge. These signals can be used to calculate the current position of a vehicle anywhere in the world with little technical effects.

- GPRS is a very cheap TCP/IP connection used to connect the Telic Picotrack unit to the internet. Data exchange using GPRS is much cheaper than data transmission using SMS messages.

In most cases, the billing of the connection of the device to the internet is not based on time but on data volume basis. Because the Telic Picotrack device sends very small amounts of data to the internet, many thousand statuses - and position reports can be sent to the internet for few Euros in most countries around the world.

If you want to use the GPRS interface of the Telic Picotrack unit the SIM card you are using must be enabled for using the GPRS service. Please contact the provider of your SIM card for information regarding this issue.

5.4 Precision of the GPS Position

The Global Positioning System (GPS) was developed in the early seventies by the U.S. Department of Defense. It is comprised of 24 satellites in various locations around the globe.



Due to the travel patterns of the satellites and their transmission technique, the precision of the data has its limits. Here we briefly present them:

A GPS receiver calculates its position by differentiating the signal from several GPS satellites. The more satellite signals it receives, the greater the precision. With a clear view of the sky, up to 12 satellite signals can be received. In order to receive a valid position, a minimum of three satellite signals are necessary. In an open field this is no problem. If the vehicle is standing still, precision of a meter or less can be achieved.

Unfortunately, we are not always presented with such ideal terrain. In the city, for instance, several problems can present themselves.

For example, shading; this means, one or more satellites are blocked out by high buildings. It is then perhaps the case that signals can only be received from some of the west, north, and south satellites, but all of the east satellites are completely blocked. This is also the case when the vehicle is stationary (or parked) close to a building.

Another source of imprecision is reflections. The signals sent out from the GPS satellites are radio signals which spread out in waves which can possibly be reflected by, for instance, large metal surfaces. Due to this reflection, the GPS module may not receive the signal directly, but rather reflected from another wall. As a result, the signal propagation delay is changed and a declination results. In areas with high density and high buildings, this can result in miscalculations of tens of meters!

A navigation system attempts to compensate for such problems by on the one hand, taking into account that you are moving, and on the other, by checking to see if the received GPS positions make sense compared to the route being driven (You would not turn and drive into a field 100 meters before an intersection).

A remote surveillance module cannot and should not use such tricks.

5.5 What do you need to use the Picotrack?

Having the advantages of Picotrack in mind, the question comes up which additional components are necessary for the operation of the device.

To use the functionality of Picotrack, it is essential to operate it together with a tracking service or tracking SW. If you didn't purchase the Picotrack together with such a tracking -service or -SW, please contact your supplier or Telic for further information, in order to be sure you are making the best use of the of the Picotrack's features and options.

5.5.1 Power supply

As stated previously the Picotrack can be installed in a vehicle; in this case you need the car power cable to connect the device to the vehicle power supply. While it is connected to power, the internal battery will be charged. If you would like to send ignition on/off messages to the tracking center the cable must be connected to the ignition cable of the vehicle.

In most other cases, the Picotrack is supplied by the internal battery, so there is no special installation necessary. The Only thing necessary is to charge the battery periodically. Charging of the battery and be done using the 230 V power supply, a car power cable with a cigarette lighter plug or the USB-cable on a PC or notebook. For further details please see chapter 16.

5.5.2 Antennas

The GSM- and GPS- antennas which are necessary for the proper operation of the Picotrack are already integrated into the device.

5.5.3 Mobile GSM Network SIM-Card

The messages of the Picotrack are transmitted via the mobile GSM network. Therefore you need a standard 3 Volts or 1.8 Volts SIM card. This can be either a prepaid or a postpaid SIM card.

5.5.4 Please give preference to post paid SIM cards!

Prepaid SIM cards have the advantage, that they don't produce fixed costs, but they have the disadvantage that the credit of the prepaid SIM-card will be exhausted at a certain moment. Then, the Picotrack will not be able to send anymore status messages.

To avoid this case, we don't recommend using prepaid SIM cards, since the device would be rendered useless in the situation were all the credit on the SIM is used up.

5.6 Operation set-up

The operation set-up of the tracking and tracing module can be realised in 6 steps.

Attention: Please take care of proper ESD measures (e.g. electrical connection of the body to ground) to make sure you don't destroy internal electronics! Repair of ESD damages forced by users due to wrong handling of the device will not be covered by Telic's warranty.

5.6.1 First step: Opening of the device

Please open Picotrack housing by screwing off the housing screws. The SIM card holder is under the top cover and allows to slide-in and to fix the SIM card.

5.6.2 Second step: Putting in the SIM card

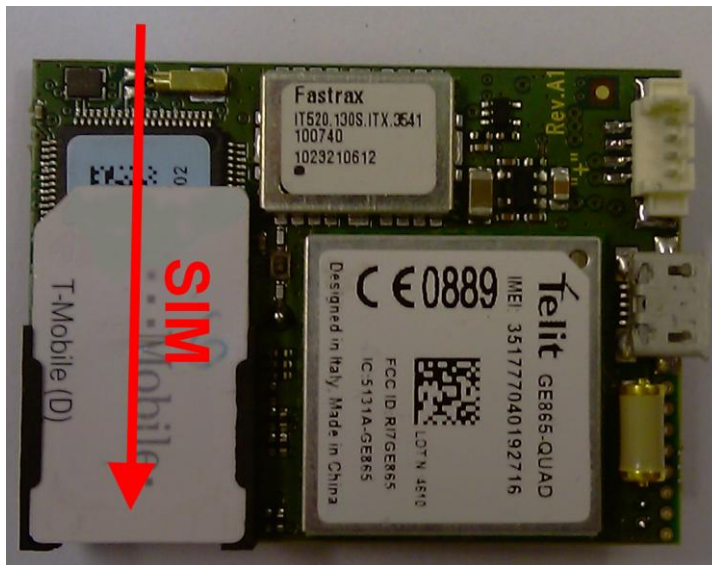
Before the Picotrack logs into the mobile GSM network, it checks whether the used SIM card is PIN free. If it is PIN free, it will start normal operation.

If the SIM card is not PIN free, it has to be assured, that the PIN is set to "0000" before it has been inserted. The PIN can be changed e.g. with a usual GSM mobile phone to "0000".

To speed up the log-in into the GSM network, the SIM card should contain no or only some few phone book entries.

The insertion of the SIM card into the Picotrack is as easy as for an average mobile phone:

- Please put the device in front of you on your desk so that you are able to slide-in the SIM card in the way the arrow on the label on the Picotrack board shows it, the gold contacts of the SIM card should be facing down.
- The SIM card has to be pushed in the direction of the arrow, until it stops.



See the above image for an example of a correctly inserted SIM card.

Important hint: The opposite cover of the housing, in which the GPS receiver is embedded, should not be opened, to avoid a contamination of the receiver which may lead to a reduction of re-

ceiving quality (should you be forced to clean the pad sometime, please do so using pure alcohol).

5.6.3 Third step: Closing the housing

Please close the device again. Please take care that the housing covers fit together tightly and properly.

Then screw tightly.

Attention: Please pay attention that the battery is not damaged or squeezed by the holder of the housing while closing the device

Furthermore please avoid any stress on the micro USB connector when it is plugged in the Picotrack. In the worst case, the connector of the Picotrack board could be damaged. Repairing damage of this sort is not covered by Telic's warranty.

The Telic Picotrack is designed to be used in indoors applications or in the inner side of a vehicle, as it should not be exposed to excessive humidity.

5.6.4 Switching the device ON and OFF:

Telic delivers the devices switched-OFF.

If you want to switch it on, please push the red button until the green LED of the left GSM-indicator starts to light-up.

If you intend to switch-off the Picotrack tracking and tracing module, please push the red button twice in quick succession. Then the green LED of the left indicator will continue to light-up a little bit, even though the switch-off process is already on its way.

Hint: pushing the red button will always be confirmed by the red LED in the centre indicator, which means it will be illuminated as long as the button is being pushed.

6 The set-up on a tracking server

The Telic Picotrack module is configurable in a way that it will send messages to a tracking server.

Within these messages, the GPS position and the status of the power supply (e.g. ignition On/Off), as well as the voltage of the internal bat-

tery backup will be sent. Please see more details in chapter 9 "the status message".

7 General Method of Operation

The Picotrack's primary task is to transmit GPS position data, including additional status information via a TCP/IP connection to the tracking server.

In case that a message can't be transmitted, the message will be stored in the device to be transmitted later. There is a storage capacity of about 1.000 position messages.

The following events will generate a position message which always contain the GPS position:

- The end of a time period of x seconds (x being configurable).
- After a distance of x meters (straight line distance to the previous event) in any direction (x being configurable) has been travelled.
- A direction change of a configurable minimum angle in x degrees (x being configured) at a configurable minimum speed of y km/h (y being configurable).
- Disconnect and connect to the external power supply (e.g. ignition of vehicle)

After switching on the Picotrack, the GSM and GPS module will be internally powered up. After logging in into the GSM network the Picotrack will try to build up a GPRS communication link. Finally a TCP/IP connection to the tracking server will be established to transmit the event messages.

The selection of the GSM network operator will take about 1 minute, plus the time to build up the GPRS- and TCP/IP-connection to the tracking server. Therefore, after switching on the device, it will take approximately 2-3 minutes until the first status message can be transmitted. Independent of this procedure, GPS positions and status information will be generated and stored in the internal memory for later transmission.

The first identified and valid GPS position will be taken as the reference position for the distance interval calculations. The next distance interval event will be generated if the configured distance has been reached. If another event (e.g. time interval event) has been generated before, the distance interval measurement starts again at the

position of this new event. That means that any position message with an actual GPS position sets a new reference for the distance interval calculations. This reduces the number of messages sent while still keeping the desired resolution of the track.

In the case of a direction change being greater than the configured angle while travelling at the configured minimum speed a position message will also be generated.

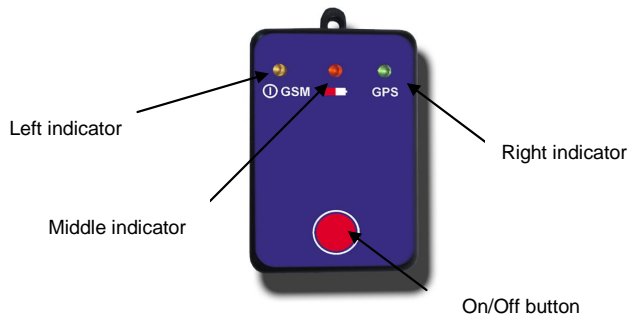
Switching on and off the external Power supply (e.g. ignition on/off) also leads to an event message; in situations where no new validGPS position is available, the last valid position will be transmitted.

8 Other Features

8.1 Device test

After the preparation or installation of the Picotrack it is recommended to check the device functions as follows:

8.1.1 Verification based on the LED indications:



The device has three status indicators representing each the status of 2-3 LEDs under the respective indicator.

| Assigned indicator | Meaning |
|--------------------|---|
| Right indicator | This indicator includes 3 LEDs under its glass, a yellow, a green and a red one and reflects the status of the GPS reception as well as the device reset. off: GPS is not switched on |

| Assigned indicator | Meaning |
|--------------------|---|
| | <p>1 time blinking yellow position acquisition not possible</p> <p>2 times blinking green 2D-Fix (no valid height and the position may be imprecise)</p> <p>3 times blinking green 3D-Fix (GPS data are complete)</p> <p>About 5 seconds red during device reset (in this case also the red LED of the middle indicator is on at the same time).</p> |

| Assigned indicator | Meaning |
|--------------------|---|
| Middle indicator | <p>The middle indicator consists of three LEDs, a green, yellow and a red one.</p> <p>The green LED will be permanently on when the Telic Picotrack has external power supply via the micro USB cable and the battery is fully charged.</p> <p>When the yellow LED is permanently on, it indicates that the tracking and tracing module has external power supply and the battery is currently charging. If the device is in sleep mode, the middle indicator works identically; just the left and the right indicator are off.</p> <p>Remark: If the middle LED is off, this does NOT mean, that the Telic Picotrack tracking and tracing module is switched off. In fact it only indicates that the device is not connected to any power supply.</p> <p>The red LED indicates the following:</p> <p>This one and the red right indicator are permanently on during the whole DOTA (Software-Update Over-The-Air) procedure.</p> <p>During download of data when the DOTA is running, the green LED on the left indicator is also on.</p> <p>It is blinking red in when the battery is "Low" indicating the battery needs to get recharged soon, otherwise the Picotrack will switch off automatically.</p> <p>In case of an internal device reset it will be on for about 5 seconds and returns to the initial status. At the same time the red LED of the right indicator is also switched on.</p> |

| Assigned indicator | Meaning |
|--------------------|---|
| Left indicator | <p>The left indicator consists of both a green LED and red LED.</p> <p>The green LED reflects the GSM status and also, whether the device is switched on.</p> <p>When the LED is off, the device is switched off.</p> <p>Permanently on means, GSM is switched on, but no GSM network is available.</p> <p>Blinking once means the device is logged into the GSM network.</p> <p>Blinking twice indicates an established TCP/IP connection to the server.</p> <p>Slow double blinking of the red LED means that the SIM card is not readable (e.g. if not correctly inserted into the SIM cardholder or others). After a certain period of time the Picotrack will switch-off completely (as it would be after twice pushing of the red on/off button).</p> |

8.2 Data buffering in case of bad GSM network

In areas of weak or no existing GSM network the device buffers the data meant for transmission in its internal data memory until GSM coverage is available.

This data memory stores the data even if the power supply of the device is temporarily interrupted. The data memory is capable of storing around 1.000 status messages.

If further data needs to be stored, even though the data memory is already entirely used, the oldest data set will be erased and replaced by the new one.

8.3 Automatic switch off of the Telic Picotrack

If the external power supply of Picotrack is interrupted (e.g. if the power supply is controlled by the ignition) and if consequently the charge in the internal battery is exhausted, the Picotrack switches off automatically.

Even though in this status there is no external power supply anymore, all relevant operation parameters, the configuration settings as well as the content of the data buffer remain stored.

8.4 The integrated watchdogs

The Picotrack has different integrated watchdogs. They automatically check the functions of the device and generate resets as soon as they recognise any malfunction.

Malfunction could occur due to internal problems of the device, problems related to the GSM connection, problems with the GPS reception and many more.

Due to this watchdog it is assured that the Picotrack is able to return automatically to stable operation if necessary.

Control of the watchdogs by the user is not necessary.

If the watchdog has to restart the device it may happen that some of the position messages and respectively events are not logged and as a result are not transmitted to the tracking server.

9 The status message

Status messages are data sets being generated due to different event types. Status messages will be sent immediately after they occur or out of the database if previously stored.

You can define the way the messages are transmitted to the control centre for every single status message. You can select between transmission via GPRS, transmission via SMS, or transmission via GPRS **and** SMS.

Independent of the current configuration all messages are transmitted via SMS if there is no GPRS connection possible (e.g. congestion of the network or a bad GPRS network coverage). In this way it is sure that almost every message is transmitted to the control centre in time.

The event-mask provides the opportunity to enlarge the status message with some more information which is not necessary for normal use. You can read out quality of the GPS-signal, MSC (Message Code:

recognition of the country) or MNC (Mobile network code: to identify the network provider). This is meant for security scenarios, to receive more information about location and status of the device.

9.1 Content of a status message

| Content | Description |
|----------------------|---|
| Event/Log - Code | Reason for the status message |
| Event/Log Timestamp | Time at which the event has happened |
| GPS Timestamp | GPS timestamp at the moment of fetching longitude and latitude |
| Longitude | Degree of longitude in 100 μ degrees |
| Latitude | Degree of latitude in 100 μ degrees |
| Fix Type | 1,2 or 3, depending on the availability of satellites in view having a sufficient signal strength: 1D Fix (no valid data) 2D Fix (no height indication) 3D Fix (position message with height indication) |
| Speed over ground | Speed in km/h |
| Course over ground | Direction in degrees |
| Sats for calculation | Actual number of satellites which are used for calculation |
| Height | Height above sea level (in m) |
| Mileage | Milage in km |
| DigIns | 4 digits e.g. 0010, if charger is connected |
| Analog Input 1 | Value of the analogue input 1 (Battery voltage with a precision of 1/10 volts) |
| MotSens | Status of the motion sensor |

9.1.1 Event and Log Codes

This code indicates which event has triggered the status message.

| Code | Description |
|------|--|
| 1 | Start-Up Event will be sent immediately after the switch-on (e.g. via ignition on) Includes the last stored GPS position, being usually generated during "ignition off". |
| 2 | Alarm Button Event - will be generated after pressing the red button for 3 seconds. |
| 6 | Direction Change Event Example: - Minimum speed: 6 km/h - Minimum change of direction: 30 degrees |
| 13 | External power supply went from "low" to "high" (e.g. ignition on) |
| 14 | External power supply went from "high" to "low" (e.g. ignition off) |
| 25 | Motion Sensor Event "Motion" - Picotrack recognizes movement and wakes up the device. |
| 26 | Motion Sensor Event "Standstill" - Picotrack recognizes standstill and sends the device into sleep mode. |
| 30 | Incoming Call Event - Picotrack sends an event message when the device is being contacted via voice call. |
| 98 | Configurable distance (in a straight line) has been travelled since the last creation of a status message |
| 99 | Configurable time period in seconds is elapsed and a related message is created |

9.1.2 Odometer

In the device a mileage counter is implemented. This mileage counter adds the covered distance and provides this value in meters.

The calculations are made based on GPS information. This can lead to deviations of up to 5%. At low speeds (e.g. jogging, biking,...) the deviation can be higher.

It is possible, to initialise the mileage counter in the device. This is useful when you mount the device into a vehicle that already has an odometer reading than zero and the user wishes to align the Pico-tracks odometer with the vehicles.

The mileage is a part of the basic configuration and can be adjusted via SMS or GPRS. Please be aware, that the numeric value has to be put in meters. So the mileage of 83213 kms has to be put as 83213000.

9.2 Sending strategies for status messages

9.2.1 Distance based status messages

One of the most significant tasks of the device is the tracing of routes. For this purpose the GPS information of the status messages is recommended.

The device sends the event including GPS position, when it has traveled a distance greater than the configured distance.

Usually the distance will get significantly shorter with the functionality being described in the chapter 9.2.2, "Direction change based status messages".

When these two methods are used in combination a typical cross country route will function as follows:

Position messages will happen more often at the beginning of a route(e.g. leaving an industrial or residential area).

On the highway position messages will be relatively seldom, as the route is straight forward.

In the target area (after leaving the highway onwards) the number of position messages will then again increase due to entering in industrial or residential areas with frequent direction changes.

9.2.2 Direction change based status messages

The device will send a status message with position information when the driving direction has changed compared to the previously generated position by more than x degrees.

An angle is configurable so that turning will always be recognized. This function can also be switched off using an event mask or another angle can be chosen. Please contact your supplier if changes are required.

9.2.3 Status messages for certain events

The Telic Picotrack tracking and tracing module sends status messages for the following events:

| Event | Description |
|---|--|
| Connection and disconnection of the external power supply | The Picotrack sends a status message as soon as the external power supply is connected or disconnected (e.g. ignition on / off). |

9.2.4 Measurement of internal battery voltage and Low-Bat message

The internal battery voltage can be measured and analysed by the Picotrack. The measurement range is 3,40V to 4,28V, the respective decimal value of the measurement is 0 to 255. Hence the following formula can be used:

$$U = 3,4V + (\text{Digits} \times 3,45\text{mV})$$

After start-up, as soon as the Picotrack has gone into the GSM-Mode, it verifies continuously the battery voltage. As soon as the voltage goes under the set threshold the Picotrack sends a Low Battery message including the measured voltage value. The Picotrack does not show this on the device itself. The threshold can be increased during operation with a configuration command, the device will send a SMS if the new value is reached.

9.2.5 Event generation via "Red Button" (Alarm Button)

Primarily the red button is used to switch on/off the Picotrack. Given the specific configuration it can also be used to generate an individual event (e.g. "emergency", "I have arrived" or any other status message). This event will be transferred to the control center via GPRS.

Additionally it can be sent to another person via SMS (e.g. dispatcher, security center etc.) As this function can be relevant for security purposes please contact your supplier before using it.

9.2.6 The speed filter

The Picotrack has an integrated speed filter for direction dependant status messages (see also chapter 9.2.2, "Direction change based status messages").

This filter prevents the sending of direction dependant status messages when the speed of the vehicle is lower than the configured value.

The advantage of this filter is that for example, if a digger is in action on a building site and is steadily turning around itself these turning movements won't be transmitted to the tracking server. Whereas in case of transport of the digger to another site, all direction changes will precisely be taken into account, so that the real route the digger made can be verified later on.

If the speed threshold is high the Picotrack will report the direction change with a certain delay. This is due to the fact that after turning right or left the vehicle needs to speed up again and reach the pre-configured minimum speed.

9.3 Hints for some special situations

9.3.1 First position of a new route

The first position of a new route is always identical to the last position of the former route. If the device at the end of a route is switched off and is switched on again later at another site, the last position stored in the logbook (of the former route) will show up as the first position of the new route with the respective errors in the odometer reading. Therefore it is not recommended, to switch off the device during transport from one site to another.

9.3.2 Last position of a new route

As soon as the ignition is switched off, the actual position is logged in the non-volatile memory.

When starting-up the device the last ignition-off position will be read out of the memory and, once the clock is set, will be sent as an igni-

tion-on position event. Nevertheless the clock can be set at the earliest when the GPS data includes a time stamp. So it might occur that the ignition-on position event will be sent delayed, especially when the GPS receiver has to readjust itself after being disconnected from the power supply.

10 Geofence

Geofence (an electronic safety fence) provides the opportunity to set a geographic square around a defined location.

Here you can set different scenarios like "leaving the area" or "entering the area" and transmit an event to the control centre.

With the Picotrack you can monitor 50 geofence areas which can also be combined to create larger areas and build up a complex protection zone.



10.1 Position Lock Alarm

With the Position Lock Alarm you can monitor if the device leaves the actual position with a predefined periphery. The actual position is stored automatically if the red button (alarm button) is pressed or the ignition is turned off. If the Picotrack then leaves the defined square (e.g. a car theft) an alarm event will be generated and transmitted to the control centre.

Applications example:

A motorcycle needs to be secured against theft. The Picotrack has to be connected via car installation cable to the ignition of the motorcycle. After turning off the engine (ignition is off) the actual position is stored. If the motorcycle is moved (e.g. by a trailer) out of the periphery, the Picotrack sends an alarm message.

11 Quick start

11.1 Hardware Installation

Check activation of the SIM - card including GPRS.

Deactivate the PIN of the SIM card using a cell phone, or change it to "0000"

Put the SIM card into the device;

The housing cover has to be opened by unscrewing the TORX screws and, after having inserted the SIM card, the back has to be fixed and screwed tight again.

Please pay attention to observe ESD protection measures.

Place the device inside the vehicle; choose a place not under metallic surfaces. Please make sure that the upper side of Picotrack has an unobstructed view to the sky.

For installation in a vehicle connect the Picotrack via the car installation cable with the ignition and plug the micro USB connector of the cable into the device.

Switch on the device by pushing the red button.

11.2 Quicktest

Put the vehicle in an area where the tracking and tracing module has good GPS and GSM reception (free view of the sky in all directions). You can identify a good GPS signal when the GPS LED is blinking green three times.

Please make sure you have good GSM reception. This is indicated by a slow once (or twice) blinking of the green LED in the left indicator.

12 Request and change of configuration:

The Telic Picotrack gets requests for actual configuration resp. configuration changes either via SMS or via a TCP/IP connection per GPRS or via the new Telic Configuration tool.

Sending a SMS to the device and having chosen the option with acknowledgement, this acknowledgement will be sent back to the sender of the original SMS.

Please contact therefore, in case of need, your device supplier.

12.1 SIM card and provider specific parameters

12.1.1 PIN-Code of the SIM card

The PIN of the SIM card will be assumed to be "0000". Also an operation of SIM cards with deactivated PIN is possible.

12.1.2 GPRS Parameter

The GPRS relevant parameters APN, user name, and password have to be configured based on the information from the GSM network provider.

If you use a SIM card from another GSM network provider, you have to set up the new GPRS Parameters using the configuration commands or configuration file.

For more information please get in contact with your supplier.

The Picotrack provides the opportunity to use preset SIM- and provider lists for each SIM card.

Please note that APN-Settings in the provider list (if used) have a higher priority than the general default APN setting.

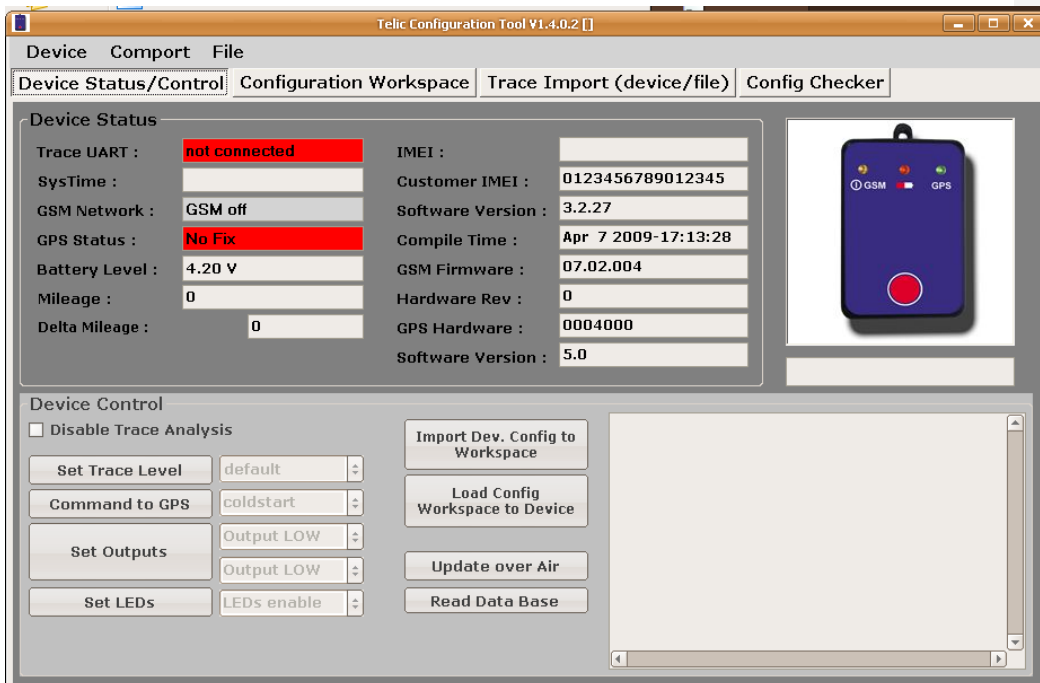
13 Telic Configuration Tool:

Besides configuring the Picotrack via SMS or gprs connection it is possible to use the Telic configuration tool to implement all settings. This tool allows the user to connect the device to a standard PC via a special Picotrack accessory cable.

Once the cable is connected the Picotrack can be monitored and completely configured using the software provided. The configuration tool allows the user to configure devices without having to manually construct commands or send any SMS to the device.

13.1 Device Status Control

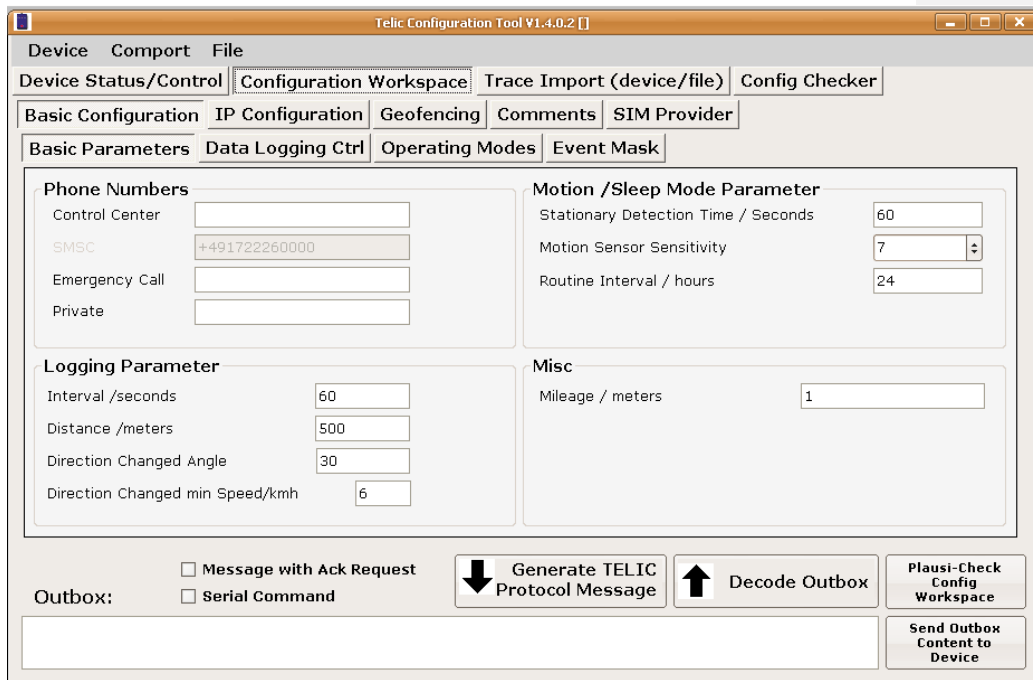
One of the main purposes of the configuration tool is to provide a very simple interface, that allows the user to immediately see the current status of the connected device. The configuration tool does this using both text and graphical information.



Configuration tool main status screen

13.2 Configuration Workspace

The second main function of the tool is to provide an easy way to configure the device without necessarily having to become familiar with all the details of the protocol. All main configurations of the device can be done through the easy to use Configuration workspace. Using the configuration workspace makes configuring the device as easy as selecting the appropriate check boxes and entering a few easy to understand parameters.



Configuration Workspace

14 Error handling

There are a number of error sources which can prevent proper operation of the Telic Picotrack tracking and tracing module.

This chapter can be used to help you detect and avoid the most common sources of errors and problems.

Possible malfunctions:

The device doesn't show any sign of life

| Possible error source | Trouble shooting |
|---------------------------------------|---|
| The device is not switched on. | <i>Press once the red on/off button to turn the device on.</i> |
| The device is not connected correctly | <i>Please connect the device following instructions in the user manual.</i> |

The device doesn't log into the GSM network

| Possible error source | Trouble shooting |
|---|--|
| The Telic Picotrack tracking and tracing module isn't in a GSM covered area. | <i>Please check whether there is GSM reception in this area (e.g. using a cell phone) and move eventually to another area.</i> |
| The position of the tracking and tracing module is not favourable. | <i>Choose another place in the vehicle which might be less shielded.</i> |
| The SIM card in the tracking and tracing module is new and has not yet been activated | <i>Please check, whether the SIM card is already activated. This can be done e.g., by putting the SIM card into your cell phone and checking, whether your cell phone is able to log into a GSM network.</i> |
| The SIM card has been locked by the provider. | <i>Please check whether the SIM card is locked. This can be done e.g., by putting the SIM card into your cell phone and</i> |

| Possible error source | Trouble shooting |
|---|---|
| | <i>checking, whether your cell phone is able to log into a GSM network. Is this not the case, than please try to make a phone call. If you are successful, the SIM card is definitely not locked.</i> |
| The prepaid bonus is exhausted. | <i>Please recharge the SIM card being in the tracking and tracing module.</i> |
| The prepaid SIM card is no longer valid. | <i>Prepaid SIM cards will lose their validity, if they aren't recharged on a regular base (often after 12 or 24 months). In this case usually you have to buy a new SIM card.</i> |
| The PIN code of the card hasn't been deactivated respectively the PIN on the SIM card is not corresponding to "0000". | <i>Please remove the SIM card from the device and check the PIN code. The PIN code has to be deactivated respectively has to be at "0000". After a triple wrong entry of the PIN, deblocking the SIM card requires the PUK.</i> |
| The SIM card hasn't been inserted into the SIM card holder in the correct way. | <i>Please check the correct position of the SIM card in the card holder.</i> |

The device doesn't log into the GPRS network

| Possible error source | Trouble shooting |
|---------------------------------------|--|
| The GPRS service is not yet activated | <i>Please ask your provider, whether the GPRS function is already activated for the SIM card in use.</i> |

The device doesn't send messages

| Possible error source | Trouble shooting |
|--|--|
| Battery of the device was completely drained (e.g. after several weeks of storage) | <i>Please recharge the device and wait for 3D GPS fix to synchronise the internal real time clock.</i> |

The device doesn't receive GPS data

| Possible error source | Trouble shooting |
|---|--|
| The position of the device is not favourable for the GPS reception. | <i>Please check, whether the device has the indicators face up and a clear view of the sky.</i> |
| The GPS receiver has no free sight to the sky. | <i>Please be aware, that a GPS receiver needs always clear view of the sky. Please ensure that the device side with the LEDs has free view to the sky. In case of metallised front window of a vehicle the device's indicators have to be oriented to the side windows if they aren't metallised.</i> |
| Your vehicle is placed in an unsuitable place. | <i>Please consider that a GPS reception is only possible when in free view of the sky. Please move your vehicle used for the test to a more suitable place (no buildings nearby, outside of a garage / factory etc.)</i> |

Further hints regarding sources of error are indicated through the 8 LEDs of the 3 indicators, which are easily visible from outside.

Details for the meaning of the different colours and blinking signs you will find in chapter 8.1.1. "Verification based on the LED indications".

15 Power consumption

If your vehicle isn't used for a couple of days and the device is correctly connected, we recommend disconnecting the Telic Picotrack tracking and tracing module from the car battery or switching the device off using the red on/off button. Otherwise, continued operation may discharge the car battery.

Sleeping modes: to reduce the power consumption of the Picotrack and therefore to reduce the current consumption from the board net respectively from the device-internal battery, the Picotrack has disposes of two (via SMS or via control centre) configurable sleep modes:

- **Time-periodical sleep mode:** the Picotrack gets into sleep state during the configurable time period, during which minimal supply current will be consumed. After this time period it will wake up again, tries for about 2 minutes to acquire a new position and will transmit the, at that moment, most recent position. SMS addressed to this device can also be handled by the device at that moment. After that the device will go back into sleep mode for the configured time period.

16 **Sleep mode controlled by the motion sensor:** In this mode the Picotrack will sleep until it recognizes movement. The sensitivity of the sensor can be selected in five levels (1=very sensitive and 5=less sensitive). If a movement is recognized the device will wake up and will send automatic messages (time, distance, direction change,...), as long as it recognizes stationary for several minutes again. The device goes back into sleep mode again and will wake up only if a new movement is recognized. Despite being in sleepmode it is possible to generate an event message at a defined interval. Therefore the Picotrack will wake up for a short time, activate the GSM module and send the message. To ensure a low power consumption the GPS module will remain deactivated. If all this is done the Picotrack will go into sleepmode again until either a movement is recognized or the interval has passed again. As long as the Picotrack is in sleepmode all LEDs are switched off. To be able to determine the difference between a Picotrack being completely switched off, the GSM LED will blink very shortly every 30 sec. Technical Data

| Components | Description |
|-------------------|--|
| Dimensions/Weight | 57 mm (long) x 38 mm (wide) x 15 mm (high), 35 grams |
| Connectors | - micro-USB – connector for the external power supply |
| LEDs | 8 status LEDs inside of the 3 indicators for signalisation of GSM, GPS, On/Off, battery charging/full, DOTA, On/Off button,... |
| GSM/GPRS module | Quadband GSM module |

| Components | Description |
|-----------------------|---|
| GPS Modul | 22/66 channel |
| Battery | 660mAh Lithium Polymer |
| Operation temperature | -20°C ~ +60°C For the charging of the internal battery the temperature range should be between 0°C and +45°C to prevent the battery from ageing. |
| Supply voltage | Recommended voltage range: 12 or 24 V DC at the open ends of the delivered supply cable (7V - 32V DC max. allowed voltage range); at the micro USB connector of the supply cable the Telic Picotrack gets the allowed supply voltage of 5V DC, if the supply cable is connected. The charging cable is equipped with internal fuses (within the DC/DC converter). Changes in the charging cable electronics should only be made by the supplier. In case short voltage peaks >32V are expected, additional precautions should be taken. |
| Housing | Black plastic housing |
| Certificates | ROHS conformance CE certified - can be mounted with the delivered charging cable into vehicles. |

Formatiert: Englisch (Großbritannien)

17 Accessories

Telic GmbH offers accessories for Picotrack which have been thoroughly tested and approved. Therefore we recommend using only accessories from Telic. Warranty claims can only be accepted if the Picotrack has been used with original Telic accessories.

Please contact your supplier or Telic GmbH for further information on original accessories for the Picotrack; recommended parts are

| | |
|---|---|
| <p>Mikro-USB/USB- Cable (part number 17005)</p> |  |
| <p>Cable for power supply with micro USB plug and open cable wires (part number 17000)</p> |  |
| <p>230V Power Plug (part number. 17001)</p> |  |
| <p>12V car charger plug (part number 17002)</p> |  |

18 Documentation Change Log

| Revision | Date | Changes |
|----------|---------------|--------------------------------|
| Rev 1.0 | March 11 2011 | First Copy |
| Rev 1.3 | June 09 2011 | Release of Picotrack II manual |

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Note: Specification is subject to change without prior notice. No responsibility is taken for the correctness of this information.