

Telic Picotrack

Endurance

GSM / GPRS / GPS Tracking and Tracing Device
with ultra long operational time

"Always know what is happening"

User Manual



Version 0.3

Sept 2011

1 A Word in the Beginning

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

The Picotrack Endurance Tracking and Tracing Modules are part of Telic's new product range. The Picotrack Endurance devices are very innovative units offering lots of tracking and monitoring options. The extremely long battery life time and low maintenance of these devices provide many new and unique possibilities.

With the Picotrack Endurance you can have the information anytime where 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 Endurance is ideally suited for the following fields of application:

Asset tracking

- Containers
- Wagons
- Trailers and swap Bodies
- Parcels
- Construction Machines
- Boats

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

Brands

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Oberhaching, 19 Sept, 2011

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Preliminary

2 Hints for this User Manual

This documentation has been written for users of the Telic Picotrack Endurance tracking devices.

Throughout this manual references will be made to using the Telic configuration tool. This is an optional tool and every setting that is made using this tool can also be made directly via SMS or through a tracking server, using the information from the most recent protocol specification.

A significant number of people have been working on this document, in order to provide 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 13 Quick start. There you can find all the relevant information, for getting the device into operation quickly.

Normally the Picotrack Endurance is used in conjunction with a specialized tracking server. This is by far the best way to take advantage of all the features the device has to offer. It is possible however to use the device without a server and using nothing more than standard SMS messages. For information on how to do this please contact Telic.

3 Delivery Content

As different applications may have similar but slightly different requirements for long term low maintenance tracking Telic offers two variants of the Picotrack Endurance, the Endurance Primary and, Endurance Rechargeable. Both variants are the same size and feature the same robust housing and mounting possibilities. Both variants offer the same software and software features.

3.1 Picotrack Endurance Primary (Part number 06508)

For all applications with medium to low tracking frequencies and the request of an ultra-long battery stand by time the Picotrack Endurance Primary is the ideal choice. The Endurance Primary features a very large 14Ah Primary cell (non-rechargeable battery). Using a Primary cell battery provides the following advantages:

- Ultra long stand-by time (up to 5 years with 2 or 3 transmissions per day)
- Higher temperature range for operation
- Extremely low self depletion of battery
- IP69k housing

3.2 Picotrack Endurance Rechargeable (Part number 06512)

For all applications with higher tracking frequencies and the ability to occasionally recharge the battery. The Endurance rechargeable features a very large 13.8Ah rechargeable battery. Using a rechargeable battery provides the following advantages:

- More appropriate for higher tracking frequencies and occasional opportunities to recharge the battery
- IP67 connector for configuration and charging (USB-power supply)
- No logistics effort to replace batteries

Additional accessories can be ordered separately (see chapter 17 Accessories)

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5 Introduction

5.1 What is a tracking module?

A tracking module is a GPS receiver used to receive satellite-supported location information. Those information will be transmitted via GSM/ GPRS mainly to a receiving station.

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

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?

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 Introduction to GPS

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 .

5.5 What do you need to use the Picotrack Endurance?

Having the advantages of Picotrack Endurance 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

The Picotrack Endurance is thought of as a Power independent device. In most use cases the device will operate for very long periods only using its own internal batteries. .

When the internal battery is significantly depleted it must either be replaced (Endurance Primary), or recharged (Endurance Rechargeable)

Charging of the Picotrack Endurance Rechargeable battery requires only a standard USB port or standard USB charge adapter and the specialized USB recharger cable available from Telic (see chapter 18 Accessories).

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 post-paid 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 several steps.

Attention: Please take proper ESD protection measures (e.g. electrical connection of the body to ground) to make sure you don't destroy internal electronics! Repair of ESD damages caused by users negligence will not be covered by Telic's warranty. Electrostatic discharge (ESD) is the sudden and momentary electric current that flows between two objects at different electrical potentials normally caused by static electricity. Opening of the device

Please open the Picotrack Endurance housing by removing the 14 screws on the outside edge of the housing (see Figure 1 - Screw locations). When the screws are removed lift the top of the device in order to reveal the circuit board underneath.

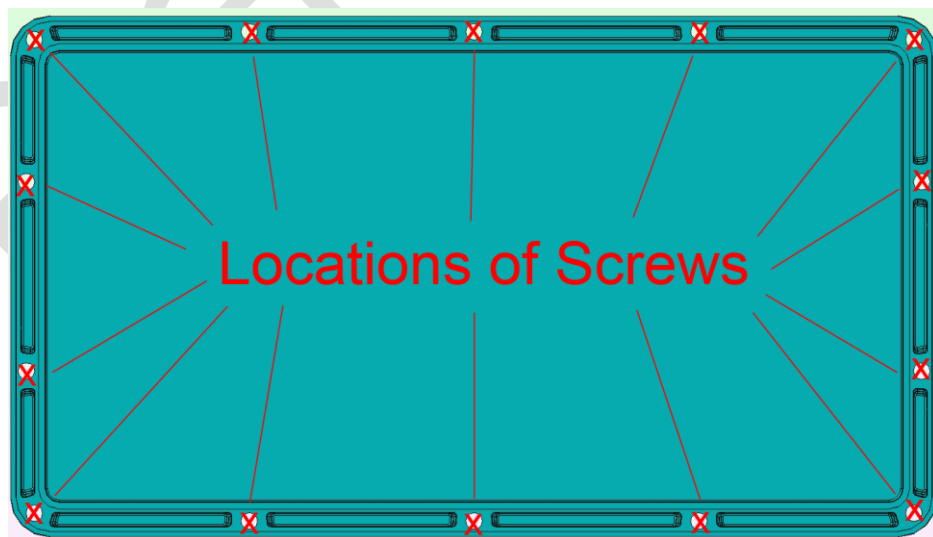


Figure 1 - Screw locations

Putting in the SIM card

In order for the device to operate correctly it requires a working SIM card from a suitable network provider is correctly inserted.

To insert the SIM card first open the SIM card holder by gently sliding the top of the holder back and then swinging it into the upright position. Then slide the SIM downwards into the top of the SIM card holder as shown in the figure below.



Figure 2 - Inserting SIM

With the SIM inserted close the top of the holder and gently sliding it forward until it snaps into place.

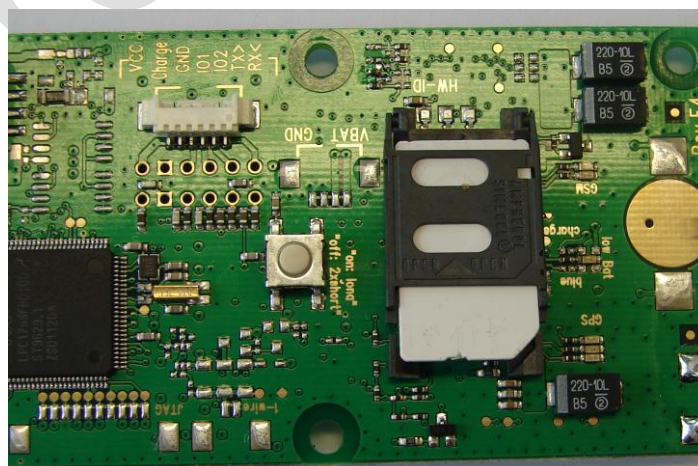


Figure 3 - Sim card in place

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 normal GSM mobile phone to "0000".

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

Important hint: Do not touch the GPS antenna in order to avoid contamination of the receiver which may lead to a reduction of receiving quality (should you be forced to clean the pad some-time, please do so using pure alcohol).

Switching the device ON and OFF:

Telic delivers the devices switched-OFF.

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

If you intend to switch-off the Picotrack Endurance tracking and tracing module, you will need to open the device and push the button twice in quick succession.

Hint: pushing the 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.

Last step: Closing the housing

Please close the device again. Please take care that the housing covers fit together tightly and properly, and that the rubber gasket is still in place.

With the cover in place re insert and tighten down all the screws. Be careful not to over tighten the screws as it will damage the case and could lead to a reduction in the effectiveness of the environmental protection of the housing.

6 General Method of Operation

6.1 The use of a tracking server

The Picotrack Endurance 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, as well as the voltage of the internal battery will be sent. Please see more details in chapter 10 The status message.

6.2 Basic operation

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

If 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 contains 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).

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 valid GPS position is available, the last valid position will be transmitted.

7 Request and change of configuration:

The Telic Picotrack Endurance gets requests for actual 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.

7.1 SIM card and provider specific parameters

7.1.1 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.

7.1.2 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.

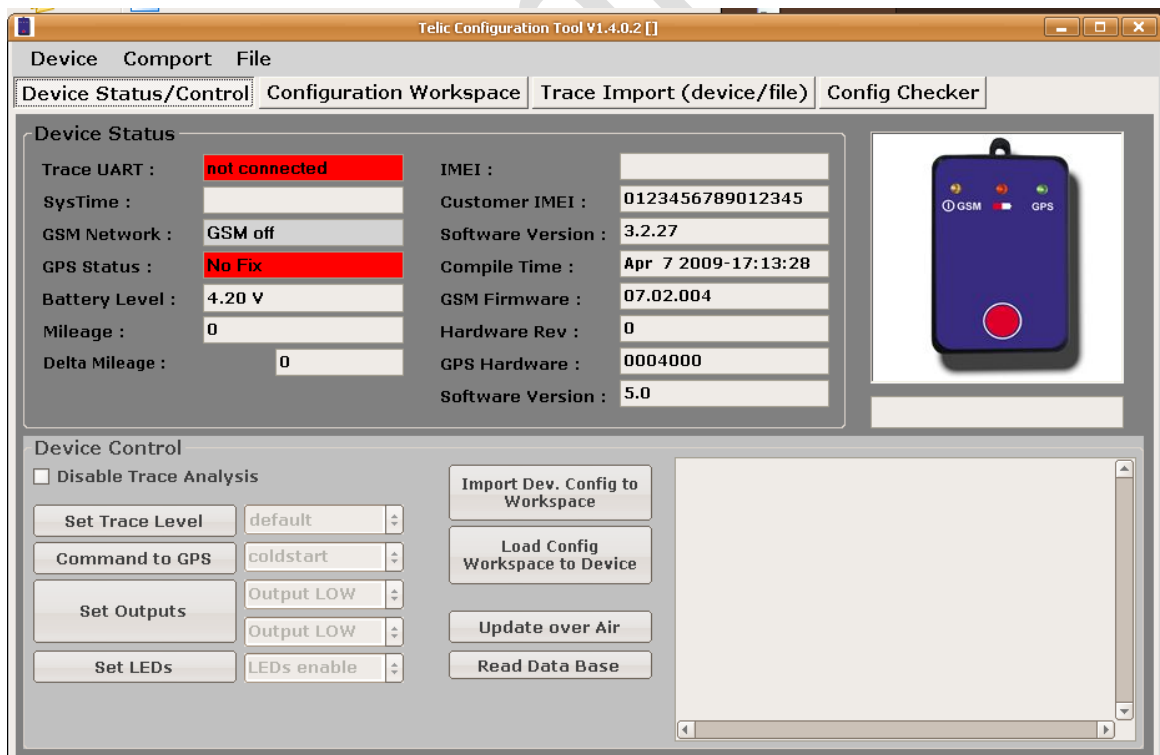
8 Telic Configuration Tool:

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.

8.1 Device Status Control

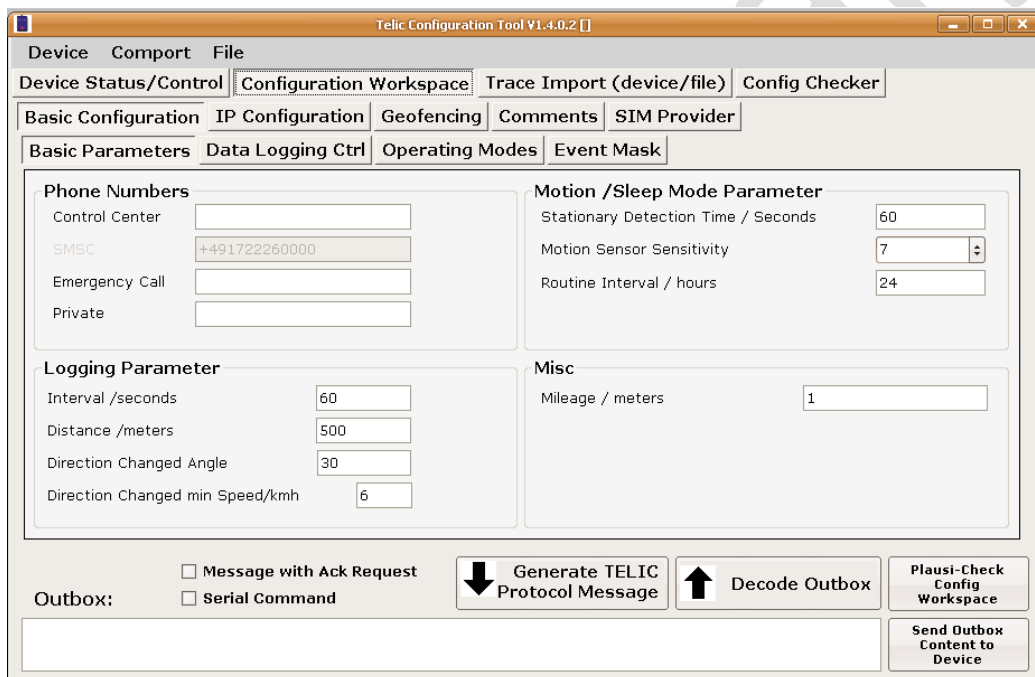
One of the main purposes of the configuration tool is to provide a very simple interface, that allows the user to immediately see the current status of the connected device. The configuration tool does this using both text and graphical information.



Configuration tool main status screen

8.2 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. Depending on the device being used and the customers preferences commands that are generated can either be sent directly to the device via an appropriate debugging cable (contact Telic for details) or copied from the Outbox and sent via SMS using whatever device (e.g. Mobile phone) the customer deems most appropriate.



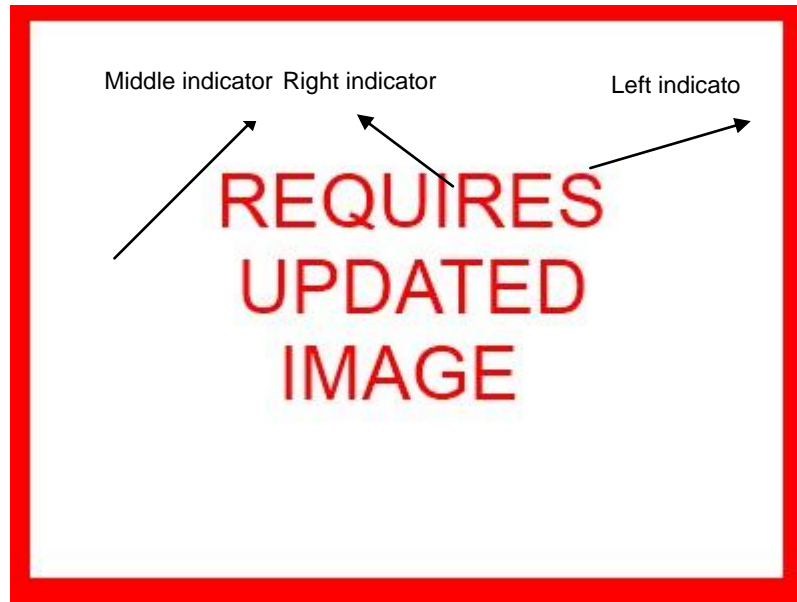
Configuration Workspace

9 Other Features

9.1 Device test

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

Verification using the LED indicators:



Internally the device has three status indicators each indicator has 2 or 3 different coloured LEDs closed grouped together.

Right indicator	<p>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.</p> <p>off: GPS is not switched on</p> <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>

<p>Middle indicator</p>	<p>The middle indicator consists of three LEDs, a green one a yellow one 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 external 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 this LED will be on for about 5 seconds and then return to it's initial status. At the same time the red LED of the right indicator will be also switched on.</p> <p>Also whenever the internal button is pushed the middle LED will illuminate red in order to indicate the button is being pushed.</p>

Left indicator	<p>The left indicator consists of both a green LED and a 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 not correctly inserted into the SIM cardholder). After a certain period of time the Picotrack Endurance will switch-off completely (as it would be after twice pushing of the red on/off button).</p>

9.2 Data buffering in case of bad GSM network

In areas with very poor or no GSM network coverage 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.

9.3 Automatic power down of the Picotrack Endurance

If the internal battery is exhausted, the Picotrack Endurance switches off automatically.

Even though in this state there is no power to the device, all relevant operation parameters, the configuration settings, as well as the content of the data buffer will remain stored, until the battery has either been replaced (Primary cell variant), or the device has been recharged (Rechargeable variant.)

9.4 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 they are not transmitted to the tracking server.

10 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 can be 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 the 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 the location and status of the device.

10.1 Content of a status message

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

10.1.1 Event and Log Codes

This code indicates which event has triggered the status message.

1	Start-Up Event will be sent immediately after the device is switched on and Includes the last stored GPS position.
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" .
14	External power supply went from "high" to "low.
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

10.1.2 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 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 other than zero and the user wishes to align the Picotrack Endurances odometer with the vehicles. The relevant location for changing the mileage counters value using the configuration tool as shown below.

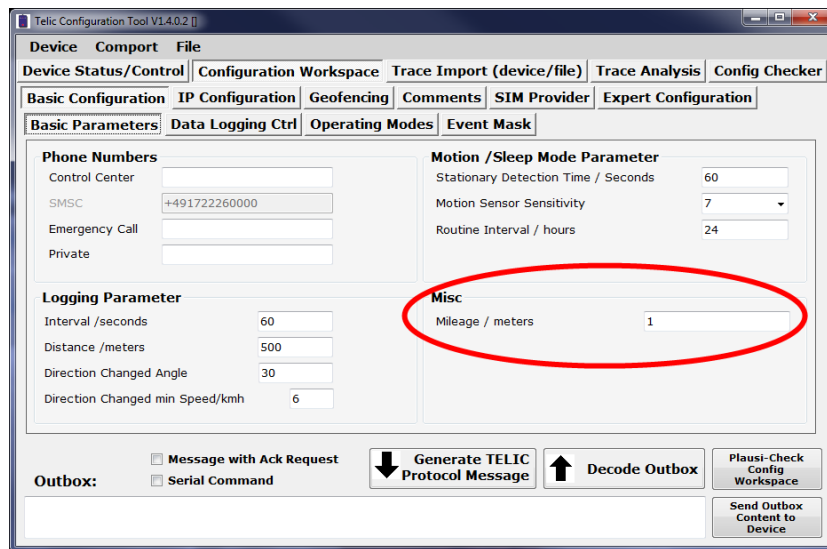


Figure 4 – Mileage counter

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

10.2 Sending strategies for status messages

It is important for the user to select the right strategy for receiving status information. The goal should be to provide all the information that is needed when it is needed. At the same time the user must also minimize power consumption by also minimizing the number of messages being sent.

10.2.1 Time 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.

Time based status messages trigger an event at regular intervals. These events can be set to be generated based on a certain number of seconds, hours or even days. See the figure below for the location

of the time interval settings used to control the time between time based status messages.

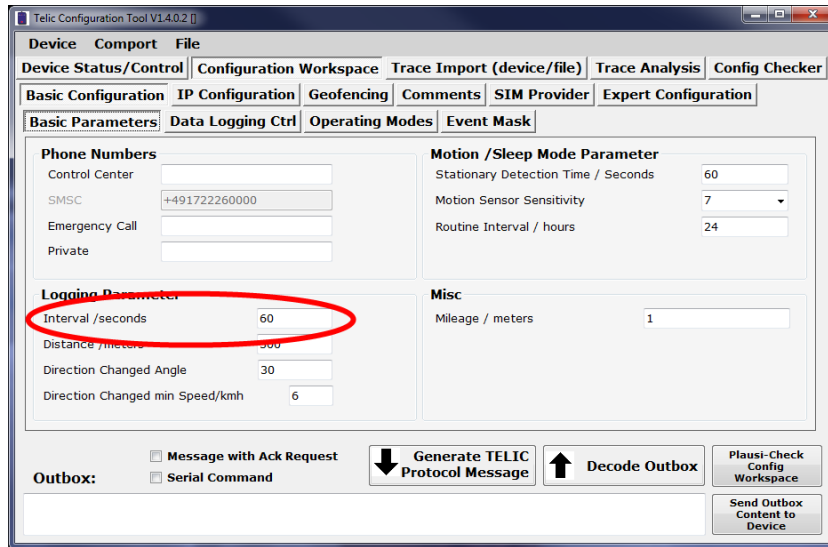


Figure 5 - Time based setting

When used in conjunction with the motion sleep mode it is possible to generate messages rapidly while the device is moving and then very slowly when the device is stationary to conserve power. When the device is in this special mode the settings from the previous Figure are used to determine the time between messages while in motion and the setting indicated below is used while the device is stationary.

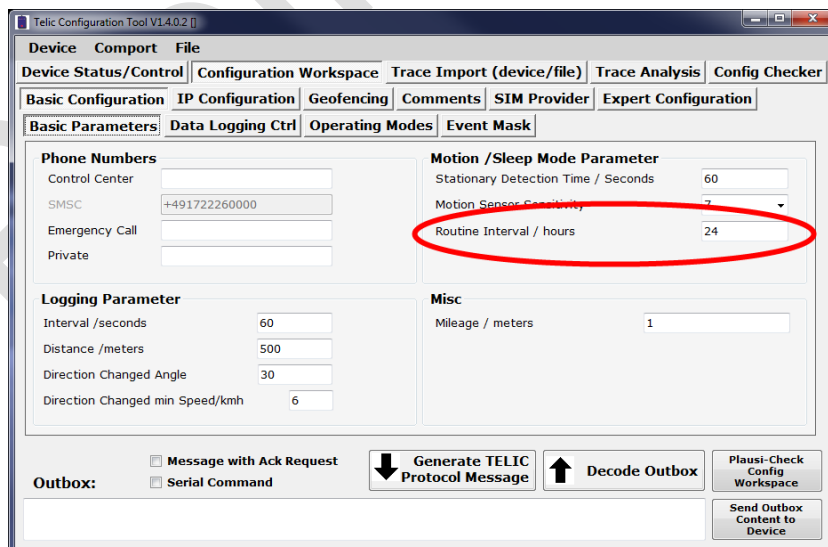


Figure 6 - Stationary routine message times

These routine time based interval messages are sometimes referred to as logging messages as they are useful for creating a log on the devices locations and current state even if nothing special or important is happening. In order to enable the ability of sending time based routine interval messages the following setting should be enabled.

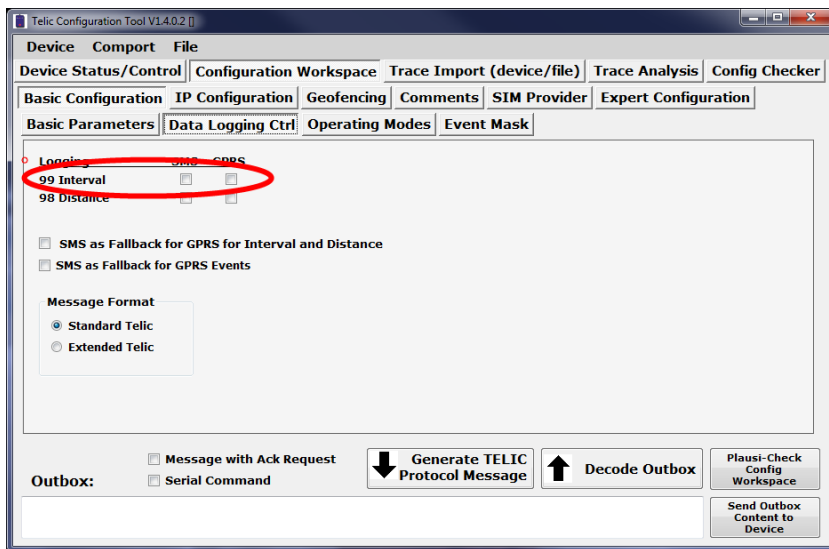


Figure 7 - Enable interval logging

10.2.2 Distance based status messages

The device can send the event including the GPS position, when it has travelled a distance greater than the configured distance. See below how to configure the distance that is used.

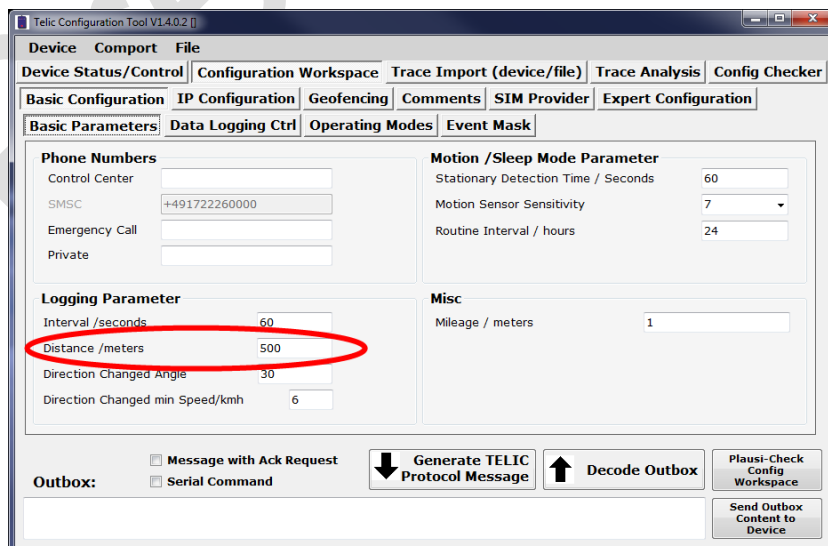


Figure 8 - Distance Interval

Usually the distance will get significantly shorter with the functionality being described in chapter 10.2.3, "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 industrial or residential areas with frequent direction changes.

10.2.3 Direction change based status messages

The device will send a status message with position information when the driving direction (course) has changed compared to the previously generated position by more than x degrees. The angle is configurable so that turning will always be recognized. The settings indicated below are used to change the triggering angle and minimum speed below.

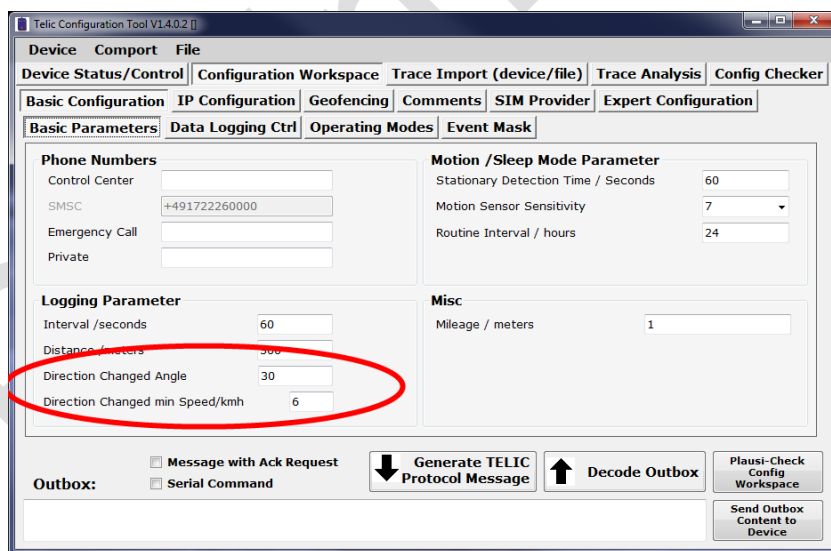


Figure 9 - Course Changed settings

The event mask is used to enable or disable this feature. The figure below shows the relevant event that must be enabled to use this feature.

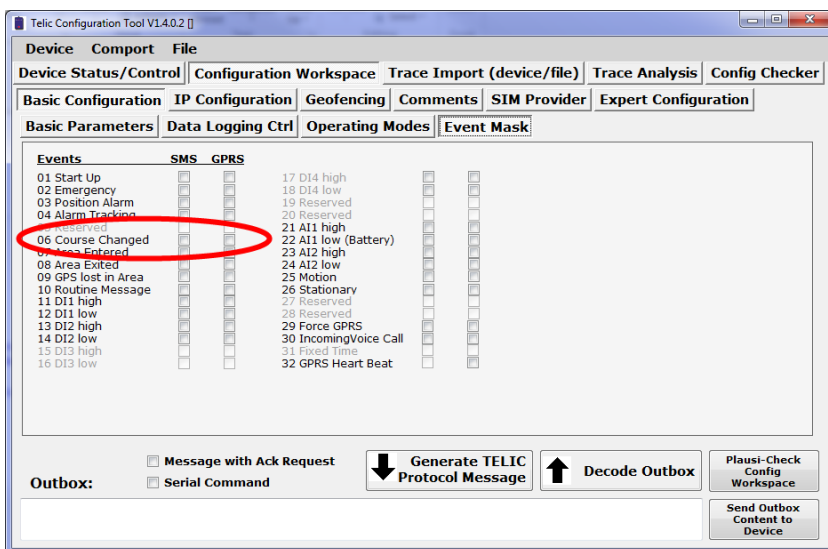


Figure 10 - Course changed event

The end result when using this setting is that whenever the device makes significant turns an event is generated that can be plotted on a map without missing any sections of road that might otherwise not have shown up.

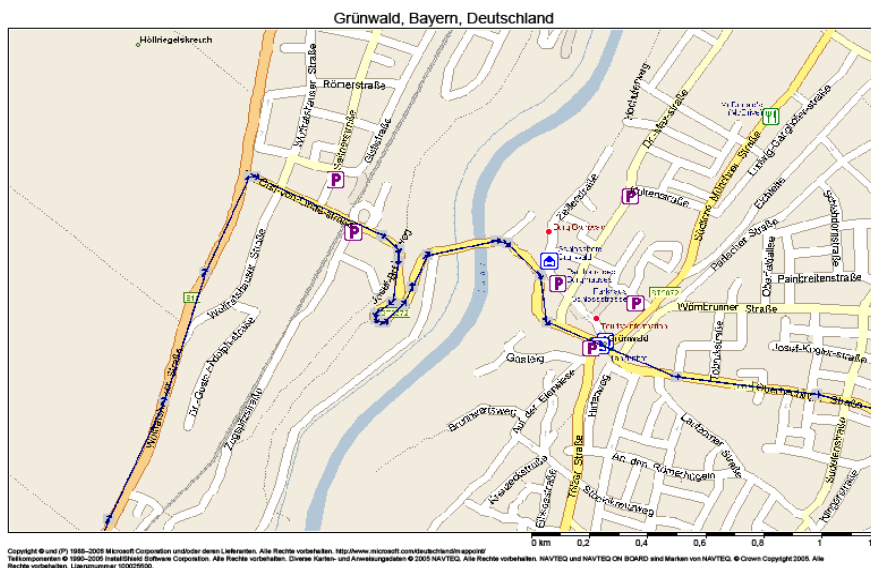


Figure 11 - Direction Change event at work

Configuration:

- Every 500m
- 30° @ >8km/h

10.2.4 Status messages for certain events

The Telic Picotrack tracking and tracing module sends status messages for several types of events that are not dependant on regular or cyclical actions. To enable or disable these events the event mask is used.

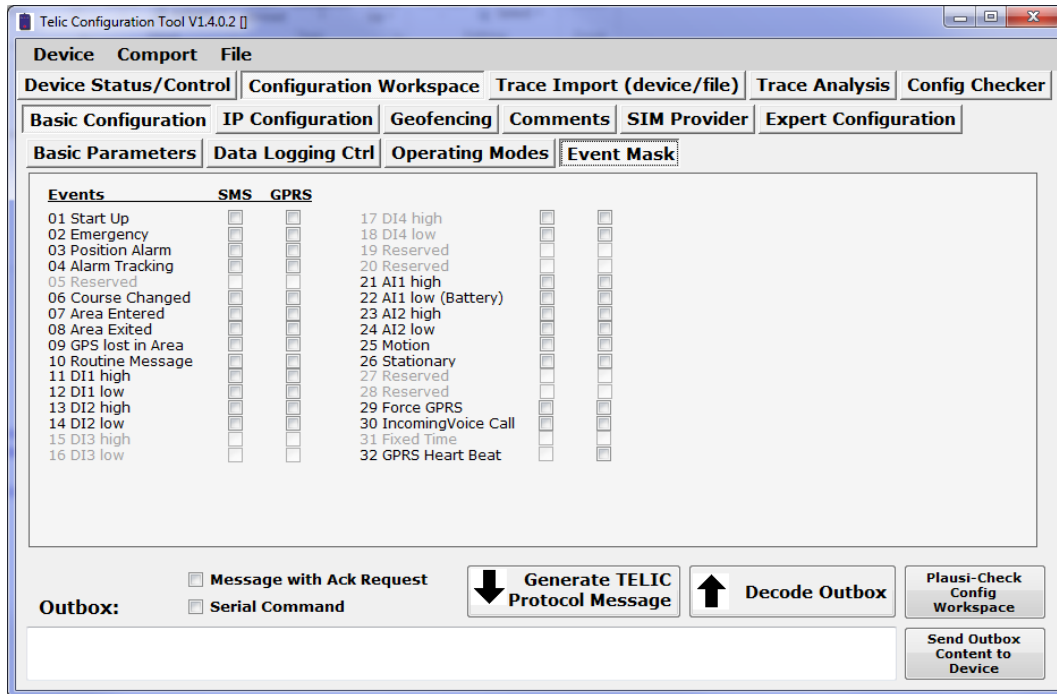


Figure 12 - Event Mask

10.2.5 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:

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

After start-up, as soon as the Endurance 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 the operation with a configuration command and the device will send a SMS if the new value is reached.

10.2.6 The speed filter

As mentioned before, the device has an integrated speed filter for direction dependant status messages (see also chapter 10.2.3, "Direction change based status messages").

This filter prevents the device from sending 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.

10.3 Hints for some special situations

10.3.1 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 transporting from one site to another.

10.3.2 Last position of a new route

When starting-up the device the last off position will be read out of the memory and, once the clock is set, will be sent as an 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 on position event will be sent delayed, especially when the GPS receiver has to readjust itself after being disconnected from the power supply.

11 Geofence

Geofencing (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.

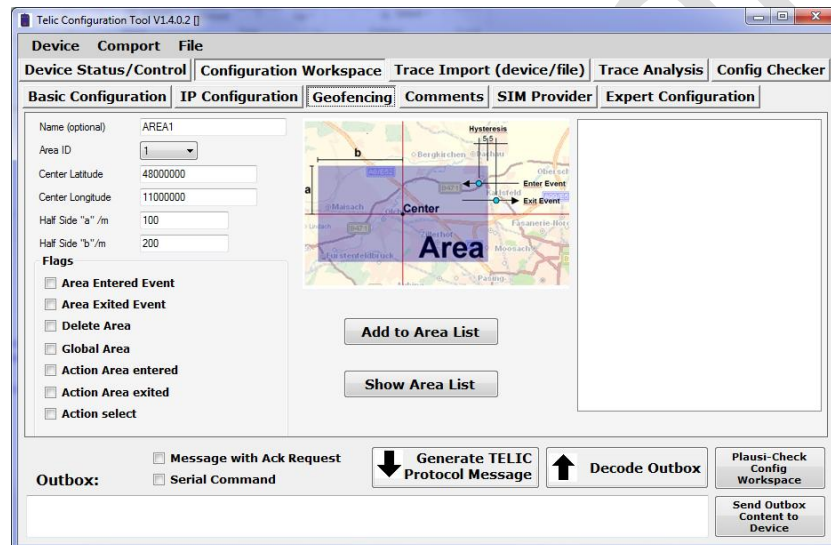


Figure 13 - Geofencing areas

Every Geofence area is given an Area ID, a center (defined by its longitude and latitude) and a height and width (from the center not completely across) in meters.

Setting the Area Entered Event Flag when creating the area will mean that when the device enters the area an event is generated. Setting the Area Exited Event flag indicates that an Event should be generated when the device exits the area. If the Global Area Flag is set that means when this new area overlaps another area the two (or more) areas should be treated as one large area. Deleting an Area is the same as creating one, but setting the Delete Area Flag.

Because often many geofence areas are used when defining an area using the tool it is possible to also add that area to the area list that is saved locally by the tool. This makes it easy to later select predefined areas, modify them if necessary and configure the device.

12 IP Configuration

Normally the device uses GPRS to send and receive data from the tracking server. In order for this to work the relevant settings from the tracking server must be configured. The IP address and the IP Port tell the device how to contact the tracking server. Under GPRS Settings the relevant APN (Access Point Name) and user login information is entered. This information comes from the network provider.

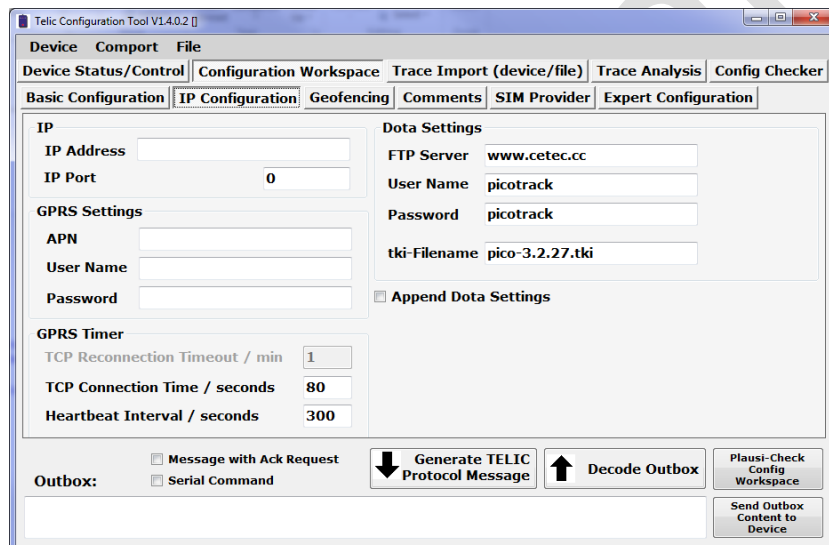


Figure 14 – IP configuration

13 Quick start

13.1 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"

Open the housing of the device. Put the SIM card into the device and then turn it on using the small button to the side of the SIM card holder. The housing cover 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 of the Endurance Rechargeable variant in a vehicle connect the device charger cable with the ignition line (via a 5 volt adapter) of the vehicle.

13.2 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.

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

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

The Device 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 checking, whether your cell phone is able to log into a GSM network. If this not the case, then 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 in the tracking and tracing module.</i>
The prepaid SIM card is no longer	<i>Prepaid SIM cards will lose their validity,</i>

valid.	<i>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 or 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 or 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

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

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

The position of the device is not favourable for the GPS reception.	<i>Please check, whether the device has the indicators facing 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 a clear view of the sky. Please ensure that the device side with the LEDs has free view to the sky.</i> <i>In case of metallised front window of a vehicle the device 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 the devices has a free view of the sky.</i> <i>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.

You will find details for the meaning of the different colours and blinking signs in chapter 0. "Verification based on the LED indications".

15 Power consumption

Sleep modes: to reduce the power consumption of the Picotrack Endurance and therefore to reduce the current consumption from the board net respectively from the device-internal battery, the device has several configurable sleep modes which are configured using the settings indicated below.

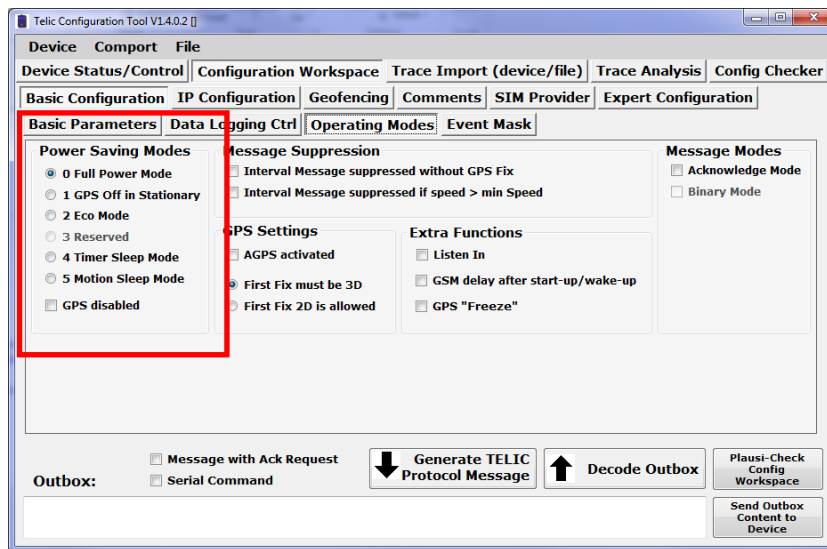


Figure 15 - Power Savings Modes

- Timer Sleep mode:** the Picotrack gets into sleep state during the configurable time period, when minimal supply current will be consumed. After this time period it will wake up again and will try 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.
- Motion Sleep mode:**
 In this mode the Picotrack will sleep until it recognizes movement. The sensitivity of the sensor can be selected in five levels (going from 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 remains 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 and in sleepmode, the GSM LED will blink very shortly every 30 seconds during sleepmode.





16 Technical Data

Environmental Rating	Endurance Primary = IP69k protected Endurance Rechargeable = IP67 protected
Dimensions	230 mm (long) x 130 mm (wide) x 30 mm (high),
Connectors	Endurance Primary = No external connectors Endurance Rechargeable = IP67 charging cable
LEDs	8 internal status LEDs inside of the 3 indicators for indicating GSM, GPS, On/Off, battery charging/full, DOTA, On/Off button,...
GSM/GPRS module	Quadband GSM module
GPS Modul	22/66 channel
Battery	Endurance Primary = 14.000mAh Primary cell Endurance Rechargeable = 13.800 Lithium Polymer rechargeable WARNING: attempting to charge primary cell can result in damage or injury
Maximum temperature	Endurance Primary = 75 C Endurance Rechargeable = 60 C
Supply voltage	Endurance Primary = none Endurance Rechargeable = 5v USB
Certificates	ROHS conformance CE certified - can be mounted with the delivered charging cable into vehicles.

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>USB- charger Cable (part number 17005)</p>	
<p>Telic configuration tool (part number ??????)</p>	
<p>230V Power Plug (part number. 17001)</p>	
<p>12V car charger plug (part number 17002)</p>	

18 SAFETY

The following guidelines must be followed in order to ensure the safety of users. If these rules are ignored Telic will not assume responsibility for any damages that are incurred.

- Never disassemble the battery
- Never Exceed Maximum Temperature Ratings
- Never Apply a higher than specified voltage to any inputs including the charging input

THIS IS A PRELIMINARY SAFETY SECTION ONLY AND WILL BE UPDATED SHORTLY TO MUCH MORE COMPREHENSIVE SAFETY INSTRUCTIONS

Preliminary

19 DOCUMENTATION CHANGE LOG

Revision	Date	Changes
Rev 0.1	Sept 13 2011	First Copy
Rev 0.2	Sept 19 2011	Several modification in almost all chapters
Rev 0.3	Sept 19 2011	Preliminary release

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